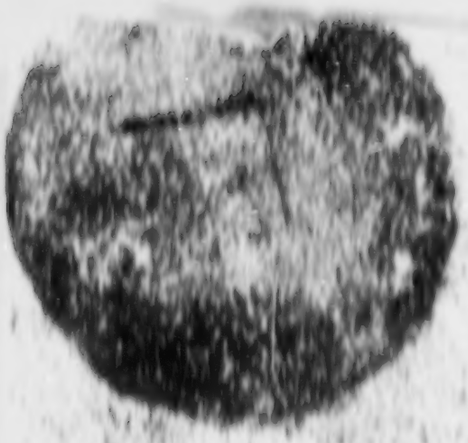
PB 197 165



HYDROCARBONS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

Part I. Categories A to E

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va 22151

118 4

HYDROCARBONS AND AIR POLLUTION:

AN ANNOTATED BIBLIOGRAPHY

PART I

Office of Technical Information and Publications
Air Pollution Technical Information Center

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service
National Air Pollution Control Administration
Raleigh, North Carolina
October 1970

The AP series of reports is issued by the National Air Pollution Control Administration to report the results of scientific and engineering studies, and information of general interest in the field of air pollution. Information reported in this series includes coverage of NAPCA intramural activities and of cooperative studies conducted in conjunction with state and local agencies, research institutes, and industrial organizations. [redacted]

National Air Pollution Control Administration Publication No. AP-71

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price $5 per two-volume set

CONTENTS

PART I.

INTRODUCTION 1

ANNOTATED BIBLIOGRAPHY

A. General 3

B. Emission Sources 19

C. Atmospheric Interaction 193

D. Measurement Methods 227

E. Control Methods 467

PART II.

F. Effects - Human Health 583

G. Effects - Plants and Livestock 737

H. Effects - Materials 771

I. Effects - Economic 777

J. Air Quality Measurements 781

K. Legal and Administrative 849

L. Standards and Criteria 865

M. Basic Science and Technology 877

AUTHOR INDEX 1041

TITLE INDEX 1061

SUBJECT INDEX 1107

GEOGRAPHIC LOCATION INDEX 1161

United States 1161

Foreign 1162

HYDROCARBONS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

As the level of air pollution attributed to automotive and stationary sources increases, so does the necessity to extend our knowledge of hydrocarbon pollutants.

Certain hydrocarbon derivatives may have direct carcinogenic effects on lung tissue. One of the major concerns with hydrocarbons as pollutants, however, is in the indirect effects attributed to their role in the formation of smog through photochemical reactions with other substances. Photochemical smog has been associated with plant damage, eye and respiratory tract irritation, and reduced atmospheric visibility.

In urban areas, aerosols and exhaust gases have been found to contain not only paraffinic, aromatic, acetylenic, and olefinic hydrocarbons but also ketones, aldehydes, phenols, alcohols, and halogenated hydrocarbons.

This bibliography represents an effort to collect, condense, and organize the literature on the hydrocarbons in relation to air pollution. The approximately 2,300 documents abstracted here are all included in the information storage and retrieval system of the National Air Pollution Control Administration's (NAPCA) Air Pollution Technical Information Center (APTIC). Most of them are from recent literature (1959-1970); however, some were written earlier in this century.

The abstracts are arranged in 13 categories listed in the table of contents. Each category is designated by a letter of the alphabet; each abstract is designated by its APTIC accession number. Since accession numbers are assigned as literature is received in APTIC, recent literature will more likely bear higher accession numbers.

A subject index, a geographical location index, an author index, and a title index follow the abstracts; they refer to the abstracts by category letter and APTIC number. The author index lists the first and second authors separately; when there are two or more, the first author is indicated by an asterisk (*). The geographical location index has two major divisions; United States, and Foreign.

This bibliography is composed of selected references. It is intended as a balanced sample of available literature, and no claim of all-inclusiveness is made.

All documents abstracted herein are on file at the Air Pollution Technical Information Center, 1031 Wade Avenue, Raleigh, North Carolina. Readers outside NAPCA may secure duplicates of the abstracted documents from libraries, publishers, or from the authors.

A. GENERAL

00164

STATISTICS ON PARTICULATE CONTAMINANTS - SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT (FIRST QUARTER 1966). San Diego Dept. of Public Health, Calif. Mar. 1966. 7 pp.

First Quarter 1966 Statistics on Particulate Contaminants San Diego County Air Pollution Control District are presented. Data are included on weight concentrations from high volume filter samples, soiling indexes, and hourly averages of gaseous contaminants.**

00311

W.L. Faith

THE NATURE, SOURCES, AND FATE OF AIR CONTAMINANTS. J. Air Pollution Control Assoc. 13, (10) 483-5, Oct. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A brief synopsis of air pollution specifying the types of pollutants, their habitat, the importance of aerosols and gases, and effect of meteorology on air pollution is presented. In broad terms, the problem of air pollution as it relates to health impairment is discussed.**

00599

J.J. Schuneman

THE NEW JERSEY AIR SANITATION PROGRAM - A REVIEW AND PROPOSALS FOR THE FUTURE. Preprint. 1964.

In order ot carry on a reasonably adequate air resource management program which will insure a desirable air supply for the State and provide for continuing growth of population, industry and commerce, a major expansion of activities of the Air Sanitation Program is needed. Major decisions concerning land and air use, degree of control of air pollutant emissions, economics and public welfare must be made in the next few years. Some of these (for example: auto exhaust control; sulfur compound, nitrogen oxides and odor control; refuse disposal problems) involve potential expenditures in the hundreds of millions of dollars. It would be wise to spend enough money on evaluation

of the situation, effects of pollution, education of the public, and study of control problems to provide a sound basis for these decisions. It is further essential that adequate expenditures be made to implement the measures found to be necessary. While it is impossible to arrive at an entirely adequate estimate on the basis of the work done in this review, it appears that the Air Sanitation Program should be allocated about $900,000 per year and be staffed with about 75 people. This amounts to about 15 cents per capita per year, based on the 1960 population. The present budget of $190,000 per year (3 cents per capita) is grossly inadequate. The proposed level should be reached in stages over a period of three years of expansion. (Author's abstract)**

00988

S. Tilson

AIR POLLUTION. Intern. Sci. Technol. No. 62:22-31, 1965.

The problem and the approaches to solving it are reviewed. Pollution sources, research, air quality criteria, the need for controls, social attitudes, standards, photochemical reactions, and future prospects are included.**

01073

V.G. MacKenzie

AIR POLLUTION - WHOSE PROBLEM? Preprint. (Presented at A Panel Discussion on Air Pollution at the Board of Directors Meeting, National Petroleum Refiners Association, Washington, D.C., Sept. 20, 1965.)

The need for conservation of air as a natural resource is discussed, with emphasis on the role of the petroleum industry. Data and means for improving on past patterns of conservation effort through Federal authority under the Clean Air Act, establishment of automotive emission standards, and application of technology to control of sulfur oxides and automotive emissions are delineated. Attention is called to the need for research on oxides of nitrogen and lead contamination. It is suggested that business leaders, by their leadership in research and education, can play a significant part in alleviating environmental health problems.**

01211

J. A. Maga

AIR RESOURCE MANAGEMENT IN THE SAN FRANCISCO BAY AREA. (California State Dept. of Public Health, Bureau of Air Sanitation); California Univ., Berkeley, Inst. of Governmental Studies. 1965. 62 pp.

Author reviews the problems of air pollution in the San Francisco Bay Area, stressing the need for effective air

quality standards. Topics covered in the report (all persons to the San Francisco Area) are: Air Pollution in the Metropolis; the concept of Air Resources Management; Weather, Topography and the Regional Air Resources; Air Pollution and its Effects; Air Pollution and its Relationship to other Regional Problems; a regional approach to the Control of Air Pollution; Control Programs in the Bay Area; and the outlook for the Bay Area.##

01170

E. Baster

DETERMINATION AND SIGNIFICANCE OF GASEOUS FUEL OCTANE NUMBERS. J. Eng. Power, Vol. 87:155-160, April 1965. (Presented at the Oil and Gas Power Conference and Exhibit, American Society of Mechanical Engineers, Dallas, Tex., Apr. 12-16, 1964, Paper No. 64-OGP-6.)

Gaseous fueled engines have for many years been built without an undue concern for the octane number of the fuel, as long as it contained a substantial amount of methane. The steady increase in engine power ratings in recent years has made the determination of octane numbers on specific gas mixtures desirable. The introduction of turbocharging for gas engines places further stress on fuel quality. A standardized apparatus and technique for determining octane numbers of gaseous fuels in the ASTM-CFR knock test engine is available. The means for making such rating are described. While ratings on mixtures of saturate hydrocarbon gases can be calculated with acceptable accuracy, the presence of unsaturates or of antiknock additives make an engine test necessary. (Author abstract)##

01640

R. Rats

SOME ASPECTS OF THE PHYSICAL AND CHEMICAL NATURE OF AIR POLLUTION. World Health Organization Monograph Ser. (Air Pollution). No. 46 1961. pp. 97-158.

This chapter of the WHO Monograph reviews work on air pollution accomplished within the last ten to 15 years. The subject of the physical and chemical nature of air pollution is so broad and covers many fields of physics, chemistry and medicine that only the most important works have been highlighted. Discussed among others were the following problems: The development of improved methods and techniques for the measurement, separation and identification of air contaminants, the standardization of methods of sampling and analysis of common air pollutants, the application of meteorological concepts and diffusion theory to the study of the dispersion of pollutants in the atmosphere, the formation of smog and the prediction of pollution levels, the development of improved analytical techniques, instrumentation and studies of motor vehicle exhaust gas composition under various operating conditions and the development of catalytic and other exhaust gas system control devices, the study of the action of sunlight on motor vehicle and traffic gas and of photochemical atmospheric reaction in general,

the determination of the health and other effects of irradiated gaseous and vapour pollutants, the continued study of carcinogenic and other toxic substances presented in the urban environment and the evaluation of their effects on health, and the study of radioactive pollutants and their effects in connection with the development of industrial uses of nuclear energy for power and transportation.##

02237

J.F. Dison J.P. Lodge

AIR CONSERVATION REPORT REFLECTS NATIONAL CONCERN. Science 146, 1040-6, May 21, 1965.

Pollutants, sources, political and economic factors, and the role of scientists in the formulation of public policy is examined in the light of present knowledge.##

02951

A. C. Stern

AIR POLLUTION AND ITS ABATEMENT IN THE UNITED STATES. De Ingenieur 77, (29) 083-93, July 16, 1965 and 77, (31) 097-104, July 30, 1965. (Presented before the Dept. for Public Health Engineering, Royal Inst. of Engineers, Hague, Netherlands, July 3, 1964.)

In the United States, visible smoke is no longer a major problem. Present concern is principally with gases; their chemical reactions in the atmosphere; the effects of both gases and reaction products on humans, animals, plants, materials and visibility; and their abatement. Considerable emphasis is placed on the relation of meteorological conditions to air pollution levels. Forecasting of weather conditions conducive to build-up of pollution is now done routinely in the United States. Although air pollution research is conducted nationally, abatement is on local basis. The new Federal Clean Air Act seeks to improve the effectiveness of local agencies, and to provide for Federal abatement of interstate air pollution. (Author summary)

03058

A. P. Altshuller.

AIR POLLUTION: PHOTOCHEMICAL ASPECTS. Science 151, (3714) 1099-6, Mar. 4, 1966

This paper gives a brief summary of presentations at the Symposium on the photochemical aspect of air pollution, which was held April 1965 in Cincinnati, Ohio. Topics ranged from the measurement of solar radiation in the ultraviolet region of the biological aspects of irradiation of model systems in the laboratory to the relation between meteorological parameters and chemical effects in polluted atmospheres.##

01005

A.C. Stern

PRESENT STATUS OF ATMOSPHERIC POLLUTION IN THE UNITED STATES. Am. J. Public Health (Presented at the 86th Annual Meeting, American Public Health Association, St. Louis, Mo., Oct. 29, 1958.) 50, (3) 346-56, Mar. 1960

The status of air pollution in the United States is reviewed in terms of knowledge available and action taken to deal with this problem. Studies by the National Air Sampling Network, state, and local health agencies are reviewed. Facilities for training persons for air pollution work are discussed, and the Federal Air Pollution Engineering Research and Technical Assistance Program is surveyed. (Author abstract)**

01205

D. Epstein.

DETECTION AND PREVENTION OF AIR POLLUTION IN THE USSR. Detection et prevention de la pollution atmospherique en U.R.S.S. C. Pollut. Atmos. (Paris) 8, (31) 273-83, Sept. 1965.

The problems of the toxic amounts of air pollutants (CO, SO2, H2SO4, NO, and 3, 4-benzopyrene) are described and the criteria for standardization in Russia given. The methods for detecting toxic proportions of these pollutants are given in detail, the techniques used for animal experimentation, and studies of the tests applicable to mankind and the techniques of applying them are described in particular. The paper mentions that since chronaxie was judged insufficiently sensitive, the Soviet authors resorted to electroencephalographic methods which reveal an electrocortical reflex for small amounts of polluting agents. These tests involving instantaneous maximum admissible concentration are supplemented by statistically analyzed experiments on animals. (Author summary)**

01401

F. Bonnamasse

DESIGN CONSIDERATIONS OF A PHOTOCHEMICAL-ATMOSPHERE ENVIRONMENTAL TEST FACILITY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 12-9 pp., Dec. 1963. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

A photochemical-atmosphere environmental test facility is a system designed to stimulate in the laboratory conditions existing in polluted atmospheres. These test environments are finding increasing applications in studying the effects of contaminated atmospheres on humans, animals, plants, or inanimate objects; evaluating air-pollution control systems; establishing air quality standards and permissible contaminant-

emission levels; identifying atmospheric pollutants and their reaction products; and investigating the mechanisms of reactions of polluted atmospheres. Many interdependent factors influence the design of a photochemical-environment test facility. Careful study of the proposed experimental program and its objectives is needed to determine the required test volume and operating conditions. The design and choice of construction materials reflect certain compromises, usually dictated by the relative importance of the various test conditions. Although probably no simulated photochemical atmosphere can ever completely reproduce all the conditions of the natural atmosphere, enough control over significant variables can be achieved to enable the test environment to assume an increasingly important role in increasing our understanding of the complex reactions and effects of photochemical air pollution and in providing much needed information for its effective control.##

03438

R. C. Blakeney and R. D. High.

CLEANER AIR FOR NORTH CAROLINA (A SURVEY AND APPRAISAL FOR AIR POLLUTION PROBLEMS). North Carolina State Board of Health, Raleigh, Div. of Sanitary Engineering and Public Health Service, Washington, D.C. Div of Air Pollution. Sept. 1959. 62 pp.

The most frequently occurring air pollution problems attributed to industrial and municipal establishments results from emissions of smoke, soot, or fly ash from fuel burning equipment. The lumber, wood and furniture industries are frequently sources of dust. Asphalt paving material plants create more acute air pollution problems than any other industry. Pulp and paper mills are the cause of odor complaints and are considered the cause of some property damage. A variety of waste disposal operations emit excessive smoke and odors. In eight cities, open dumps have caused complaints and in five cities semi-landfills (burning before covering) have resulted in public request for relief. Control of gases, dusts, and other pollutants cannot be legally required by the State except through the Nuisance Code or indirectly through some other statue. The lack of specific State legislation limits the control of air pollution to the jurisdictional area of a few cities, whereas pollution of community air is not confined to man-made boundaries or jurisdiction. Existing and potential air pollution problems requiring further investigation are discussed.##

03547

R. W. Korth, R. C. Steward, R. C. Stahman

DEVELOPMENT OF A CYCLE CONTROLLER FOR CHASSIS DYNAMOMETER. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-62.)

A closed-loop speed feedback control system has been developed for a chassis dynamometer; the system permits precise speed control of an automobile following a cycle that represents average driving conditions. This system, when used in conjunction with a variable-length cruise-mode device, permits the generation of consistent exhaust emissions from an automobile being used to charge large irradiation chambers with dilute exhaust gas during lengthy air pollution experiments. The application of this control system is being extended to include operation with a range of vehicles having widely varying power and response characteristics. (Author abstract)##

01556

R. Kats.

SOME TOXIC EFFECTS OF AIR POLLUTION ON PUBLIC HEALTH. Med. Serv. J. (Can.) 16, 504-25, June 1960.

Nature of atmospheric contamination is reviewed. Brief descriptions are given of air pollution episodes, legislation, epidemiology, sources of air pollution and their effect on health. Air pollution research in Canada is summarized.##

01674

J. P. Lodge, Jr.

AIR POLLUTION (REVIEW OF APPLICATION OF ANALYSIS). Anal. Chem. 33(5):38-43R, Apr. 1961.

This review covers the years 1959 and 1960, which have seen great activity in the air pollution research field. It supplements the previous review, with the exception that the growth of the literature has been so great that explicit coverage of radioactive pollutants has been omitted from this review. The trend toward increased interest in automotive exhaust and atmospheric carcinogens, noted in the previous review, has continued. In addition, there has been a renewal of interest in atmospheric lead. For the most part, these observations hold only for the United States. The bulk of research in Europe continues to be directed toward improved methods for measurement and control of sulfur dioxide and dust. Meetings and conferences were numerous. The annual symposia organized by the Committee on Air Pollution, American Chemical Society, featured sessions on automotive exhaust and on polynuclear hydrocarbons in 1959, and on photochemistry and fine particles in 1960. The Air Pollution Control Association continued its regular schedule of meetings. A conference on air pollution research was sponsored by the U.S. Public Health Service in New Orleans in early 1960, continuing a series of meetings intended primarily for the Public Health Service contractors and grantees in the field. More specialized meetings included a conference on dust in Vienna, one on adhesion of fine particles at Leatherhead, England, and a symposium at Oxford on atmospheric diffusion and turbulence. Increasing public interest in air pollution resulted in the publication of a large number of papers intended primarily

for public consumption. These are too numerous and in general too lacking in novelty to warrant mention here. On the other hand, a substantial number of books and review articles of a general nature were published having high scientific merit.##

06052

R. Haddad and J. J. Bloomfield

ATMOSPHERIC POLLUTION IN LATIN AMERICA. Bol. Ofic. Sanit. Panam. 58, 291-9, Sept. 1964. Sp. (Tr.) (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 5-12, 1961.)

Latin America is an area which is experiencing a very rapid population and industrial expansion. Although this growth is very irregular, the cities which exceed a million inhabitants and the industrial concentration in them is growing yearly. This phenomenon has resulted in serious problems of air pollution in Sao Paulo, Brazil, Santiago, Chile, Mexico City, Mexico, which are in need of further investigation and control as quickly as possible. There are potential problems in Buenos Aires, Argentina, and in all those large metropolitan centres which are growing and industrialising rapidly. The situation created in Lima, Peru, because of the fishmeal industry, seems to be fairly well controlled. The greatest necessity is to train personnel capable of conducting studies in measuring air quality and controlling the contamination of the air. There is also a necessity to create a consciousness of the seriousness of the problem among government authorities and the public in general. It is hoped that the future development of the Institute of Occupational Health and Air Pollution Research in Santiago, Chile, will contribute effectively to achieve these objectives.##

06214

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-16, Aug. 1965. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO_2, SO_3, H_2S, CO_2, CO, NO_2, N_2O_3, O_3, aldehydes, HCl, NH_3, HF, Pb, Hg, Cd, As, Be and 3, 4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New York, London, Los Angeles, Pittsburgh, and Yokkaichi are

described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO2 in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

04487

R. T. Cousins

CHEMISTRY OF TOWN AIR. Research (London) 15, 321-6, Oct. 1962.

A review of the chemistry of urban air pollution in London and other cities is presented. Topics briefly discussed and summarized included: sources of air pollutants; fuel combustion principles; pollutant measurements; concentrations; air pollutant properties; chemical reactions affecting air pollution. Chief sources of air pollution are seen to be fuels burnt for domestic, industrial and commercial heating, and for power generation and transportation. The more important pollutants are considered to be smoke (and associated particulate matter including H2SO4 and tar) SO2, CO2, oxides of nitrogen, hydrocarbons, and ground deposits. The more important meteorological factors affecting pollutant concentration are seen to be temperature (highest in cold weather), turbulence and wind, and temperature inversion. Factors which illustrate the differences in air pollution characteristics to be found in various cities are evident in a comparison between London and Los Angeles, the latter being more affected by vehicular exhaust contaminants and photochemical reactions than London where the atmosphere contains more heating fuel exhausts such as SO2 and smoke.##

00166

W. Hayhurst and J. T. Middleton

THE CASE FOR CLEAN AIR (SPECIAL REPORT). Mill Factory 80,(4) 41-56, Apr. 1967.

The introduction in the form of a series of questions put to Dr. Middleton is of special interest in indicating the forward thrust of the Federal government in air pollution control since he is the Director of the National Center for Air Pollution Control which has the responsibility for the administration of the Federal air pollution control laws and regulations. His answers indicate vigorous activity by the Federal authorities where local authorities fail to act. The major provisions of the proposed Air Quality Act of 1967 are outlined as well as the existing Federal authority under the Clean Air Act of 1963. With this background of increased Federal activity and especially with the issuance of emission standards, this definitive review continues with an outline of the various types of air pollutants, their sources, and the accepted methods of control. In the section

covering what is being done by industry today, examples are given of the control measures in effect at a rubber processing plant, a cement plant, steel plant, and a foundry.##

06722

A. Goetz

PARAMETERS. Symp. Environ. Measurements, Cincinnati, Ohio, 1963. (PHS Publ. No. 999-AP-15.) (July 1964). pp. 29-34.

Air and water as gaseous and liquid components of the environment are considered essential ingredients for human, animal, and plant life -- ingredients that are also acted upon by these live forms. Air and water are evaluated in terms of chemical and physical parameters relating to their occurrence in the natural regenerative and degradative cycle and to their physiological assimilation. Particulate pollutants and reactive gases are discussed. Emphasis is given to the physical and chemical characteristics of aerosols and their potential role as pollutants of environmental significance. (Author's summary)##

06723

J. E. Nader

DATA ACQUISITION SYSTEMS IN AIR QUALITY. Symp. Environ. Measurements, Cincinnati, Ohio, 1963. (PHS Publ. No. 999-AP-15.) (July 1964). pp. 107-23.

Two major automated data acquisition systems are now being used in the United States for air quality measurements. These systems, operated by the Los Angeles County Air Pollution Control District and by the U.S. Public Health Service (Continuous Air Monitoring Program), are reviewed in detail; plans for automated data handling by the California State Health Department are discussed briefly. Design and operation of these systems are reviewed in terms of sampling, detection, recording, data validation, and data display. (Author's summary)##

06744

T. Suzuki

AIR POLLUTION IN JAPAN. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo) 2, (2) 1-4, 1964. Jap.

The nature of air pollution in Japan has been changing. Pollution from the chemical industry, petroleum processing, and automobiles has become more prevalent than dust and soot from coal and heavy fuel oil. At present, the degree of air pollution is indicated primarily by the amount of dust and soot fall and concentration of SO2 and floating dust, and secondarily by the concentration of carbon monoxide, nitrogen oxides, and hydrocarbons. Use of heavy oil and coal of very low grade makes

the situation worse. General considerations of the effects of pollutants on the human body are given. Studies made by the Yaeaguchi Medical School on floating dust and SO2 indicate a correlation between concentration and death rate. Mention is made of the now familiar "Yokohama Asthma". It was found that in Yokkaichi city, air pollution is especially heavy when the wind velocity is greater than 5 m/sec and SO2 is highly concentrated. The death rate from lung cancer in Hokkaido for 1950 to 1960 was 1.6 times as great as the mean value for the rest of Japan. Maximum allowable concentrations of various pollutants are tabulated for the United States, Soviet Union, and West Germany.##

07151

F. Begemann

TRITIUM IN THE ATMOSPHERE. Tritium in der atmosphare. Umschau (Berlin) No. 22 741-2 (1966). Ger.

The current state of knowledge about tritium in the atmosphere is reviewed. Tritium originates in the stratosphere through bombardment of nitrogen and oxygen by cosmic radiation. Having a half life of 12.1 years, it can be used as a tracer to study various atmospheric problems. Since tritium is also contained in radioactive fallout, the concentration has doubled every 1.5 years during the last 12 years. Tritium is also found in methane in the atmosphere, but this probably stems from a leak in an industrial facility.##

07208

S. Somasci and G. Sesso

LIQUID FUELS IN CENTRAL HEATING INSTALLATIONS FOR URBAN HEATING. I Combustibili Liquidi Nelle Centrali Termiche per Il Riscaldamento Urbano. Fumi Polveri (Milan) 7 (4), 79-84 (Apr. 1967). (It.)

Various sources of energy used throughout the world are compared for the years 1900 and 1960. In 1900, 57.0% carbon, 2.2% petroleum, 38.7% wood, 1.0% natural gas, 0.1% hydroelectric energy, and 0.2% other were used, whereas in 1960, 41.6% carbon, 26.6% petroleum, 19.1% wood, 11.6% natural gas, 1.1% hydroelectric energy, and 0.0% others were employed. A similar study in Italy from 1920 to 1960 also shows that the use of petroleum has increased. By 1970 it is estimated that 101.7 million tons of combustible oil will be burned compared to 70 million tons in 1965. The use of solid fuels is expected to decrease in the future and liquid fuels such as petroleum and natural gas, as well as nuclear energy will increase. Liquid fuels are divided into distillate oils such as kerosene and gas oil and residual oil such as naphtha, paraffins, and aromatic hydrocarbons. Air pollution results from combustion of residual oil if the combustion chamber is not large enough, if there is no turbulent mixing, and if the temperature is not high enough to ensure complete combustion. The best source

of fuel would be distilled gas oil with a low sulfur content. The use of central heating systems in a manner which will produce optimum conditions for heat output and eliminate air pollution is mentioned.##

07599

Barnes, J. R., P. Bonnevie, G. R. Fair, P. J. Lawther, R. Rollin, R. Laird, and R. Pavanello

MICROCHEMICAL POLLUTANTS IN THE ENVIRONMENT. Preprint, World Health Organization, Geneva, Switzerland, ((20p.)), 1963. (Paper No. WHO/PA/110.63.)

An attempt is made by the World Health Organization to assess the contamination of air, soil, food and water by the many organic chemicals man synthesizes. The problem, with respect to air pollution, is the contamination of air by the products of combustion, complete and incomplete, of carbonaceous fuels and their contained impurities. Pollution of industrial atmospheres by synthetic organic chemicals and their intermediates is common. The problems involved in this transient type of pollution are likely to be local in extent and, since the chemical concerned is already identified and its properties known, precautions against its inhalation can be applied accordingly. Pollution of the communal air by synthetic organic chemicals is probably insignificant. It is doubtful whether the synthetic pesticides, whether formulated as liquids or powders, can easily be redispersed in inhalable form since their formulations and the methods by which they are dispersed are designed to produce maximum retention by the surfaces to which they are directed. Emissions of synthetic organic chemicals by industry are likely to be very small since they are prime products and not wastes. Within a factory, any waste synthetic organic chemicals can be destroyed in the same way as odoriferous gases. The destruction of scrap organic material such as waste plastics ought always to be complete and such material should never be burnt on open dumps. There is good reason to deduce from investigations on the pollution of air by motor vehicle exhausts that the ultimate fate of organic matter in the air may be complete oxidation. Some chemicals may take part in reactions by which irritant new substances are formed as more or less long-lived intermediates. This type of pollution can hardly be said to be due to synthetic organic chemicals, but exemplifies what might follow the emission into the air of truly synthetic chemicals.##

07845

Parker, A.

WHAT'S IN THE AIR. J. Inst. Fuel, 40(315):173-175, April 1967.

We each breathe about 35 lb of air in a day, consume 3 to 4 lb of drinking water and 1 1/2 lb of dry food. This provides energy by oxidation of carbon and hydrogen of which the thermal value is about 12,000 Btu, equivalent to that provided when 1 lb of coal is burnt. Some of this energy is given out as heat, say about 400

Btu/h. Records of smogs in various countries since 1873 exist, but that in London in 1952 had great effect leading to the Beaver Report and the Clean Air Act, 1956. 2.7 million ton of smoke were discharged into the air during 1938 in Britain, of which 61% was from domestic sources, 10% from railways and 27% from industry. This was reduced to 1.1 million tons in 1965, of which 0.9 million, 80%, was from domestic sources. This reduction was also helped by the rationing of coal during the years of World War II and by the desire for cleaner domestic heating methods. 4.1 million tons of sulphur dioxide were discharged into the atmosphere in Britain in 1939 and 6.4 million tons in 1965, but the concentration of SO2 in the air near the ground has stayed the same. The problem is not yet solved. About 14 million motor vehicles in the U. K. emitted perhaps 5 million tons of carbon monoxide and 1/4 million tons of hydrocarbons in 1965. The interaction of hydrocarbons, oxides of nitrogen and ozone, in sunlight causes the smogs of Los Angeles in which visibility is scarcely reduced and so they are of a different character from London smogs. The International Union of Air Pollution Prevention Associations was recently founded. Its first International clean air congress was held in London in October, 1966. (Author's abstract)##

00071

Gasseligard, P. H.

CURRENT STATUS AND FUTURE PROSPECTS -- REFINERY AIR POLLUTION CONTROL. Preprint, 11p., ((1966)). (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 13, 1966.)

The oil industry has been engaged in air conservation research and practice for almost two decades, both through the efforts of individual companies and through programs of its trade association, the American Petroleum Institute. The present status and prospective methods for controlling smoke, hydrocarbons, oxides of sulfur, particulates, and carbon monoxide in the petroleum industry are discussed briefly.##

00231

AIR POLLUTION AND THE UBIQUITOUS AUTO. Environ. Sci. Technol., 1(11):878-880, Nov. 1967.

The recent report of the Commerce Department's Panel on Electrically Powered Vehicles is discussed. "The Automobile and Air Pollution: A Program for Progress" details 16 specific recommendations to serve as a basis for immediate action. There is an urgent need for more extensive information regarding the significance of specific and combined air pollutants on public health. Little is known of the social and economic costs of air pollution. The entire area of meteorological effects of air pollutants is speculative at present and only a beginning has been made in the design of meaningful research programs. The panel feels that [the Federal Government should continue to establish

standards for all harmful automotive emissions and realistic timetables for the achievement of such standards.) Lead emissions particularly concerned the panel, because of possible impact on human health, increased levels of hydrocarbon in auto exhaust; modification of atmospheric processes; and deactivation of catalysts or absorbants which may be necessary to reduce emission of other pollutants. The panel feels that the emission standards should specify total mass of specific pollutants. The National Center for Air Pollution Control in its current organization does not appear appropriate for effective action. The panel would like to see an advisory board at the highest departmental level. The use of low pollution performance criteria rather than detailed product specification in the vehicle procurement process would provide strong incentives. To meet future emission standards, more and better technology must be developed. The panel feels that: During the next decade, in the normal course of events, no significant reduction in total air pollution will be achieved through the introduction of unconventional low-polluting vehicles. Gas turbines are reasonable alternatives to internal combustion engines in the large sizes used in trucks, trains, and buses. Hybrid power plants might provide satisfactory performance. Because two separate energy sources are needed, such hybrids might be too expensive for private passenger autos.

09910

Kalikow Peter H.

THE GROWING PROBLEM. Mech. Eng., 89(7):19-21, July 20, 1967.

The facts, figures, and concern about the national problem of air pollution are covered. Past air pollution episodes, sources and types of pollutants released in the atmosphere, and the mechanisms and characteristics of temperature inversions are reviewed.

09760

Environmental Science Services Corp., Stamford, Conn.

AIR POLLUTION CONTROL PRIMER. 15 p., ((1968)).

The main sources of air pollution are combustion processes, especially internal combustion engines. In a general manner the following are discussed: causes and effects of air pollution; legal aspects; automobile emissions; fossil fuels and lead additives; and control equipment and its market potential.

11227

J. E. Yocom

AIR QUALITY. In: Instructional Material for the Connecticut Air Pollution Simulation Model Program

Travelers Research Center, Inc., Hartford, Conn., 10p., 1968. 8 refs. (Presented at the TRC Seminar, Hartford, Conn., Oct. 12, 1968.)

The nature and composition of clean air itself is reviewed. An almost infinite number of individual chemical compounds, singly and in combination, and existing in a variety of physical forms contribute to community air pollution. The most important pollutants and classes of pollutants found in majority of communities may be listed within five categories: carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, particulate matter. A discussion of each is presented to show their sources and importance in air pollution problems. Criteria background information which is required prior to setting air quality criteria for SO2 and other pollutants is presented.##

12177

John T. Middleton

AIR QUALITY AS A CONTROLLING FACTOR IN LIFE PROCESSES. In: Biometeorology, Proceedings of the Twenty-Eighth Annual Biology Colloquium, 1967, William P. Lowry (ed.) p. 67-79, 1967. (9) refs.

The quality of air is determined by the uses made of it and by the pollutants injected into it by man. The quality of air varies for a number of reasons, but principally because of contaminants arising from economic and social developments throughout the world. Air pollution is one of the undesirable side effects of this growth and development. The extent, severity, and character of man-made air pollution are determined by the kind, number, and location of contaminant sources, the chemical reactivity and interaction of the pollutants, the topography of the land, the weather, the nature of the community, and the characteristics of the airshed.##

16679

Biersteker, Klaas

AIR POLLUTION IN THE NETHERLANDS. Tijdschr. Gew. Gezondh. (Assen), 47(3):66-70, Jan. 31, 1969. 28 refs.

In a survey conducted in 1965, all Dutch municipalities with populations above 50,000 reported experiences with air pollution. Many complaints center on local nuisances, particularly the odors caused by a potato plant in Groningen, textile industries in the eastern part of the country, spice, timber, and oil operations north of Amsterdam, and oil refineries and phosphate plants in Rotterdam. The odors are frequently a result of water pollution, indicating a connection between the two types of pollution, at least in the Netherlands. Because of the increasing concentration of population and industries in the area comprising Rotterdam, Amsterdam, and The Hague, a further increase in air pollution problems is anticipated. Tables give the standard smoke concentrations in central Rotterdam in the winter months for the

years 1957 to 1963 and the 3,4-benzopyrene content at two sampling stations in Rotterdam from 1961 to 1967. Also tabulated are the distribution of Dutch municipalities according to the number of inhabitants since 1900 and the population densities of The Netherlands and other countries.

16521

Urrutia, B. Jose Llado Fernandez

ASPECTS OF INDUSTRIAL CONTAMINATION. (Aspectos de la contaminacion industrial). Text in Spanish. Rev. San. Hig. (Spain), 43(9-10): 661-711, Sept.-Oct. 1969. (Pages 691-710 are pertinent to air pollution.) (Presented at the Conference of the Sociedad de Higiene y Medicina Social, April 16, 1969.)

The industrialization processes, the increase in industrial water and air pollution, the causes of contamination, and Spanish legislation for the control of air and water pollution are discussed. The principal atmospheric contaminants are carbon oxides, sulfur oxides, nitrogen oxides, hydrocarbons, and particulates. The amounts were estimated and it was found that half of the pollutants are concentrated in the major cities. The main sources of pollutants are automobiles, heaters, incinerators, and industrial processes. Industrial emissions are not controlled because of poor equipment, insufficient finances, and inefficient legislation. Another important source is radioactive contamination from laboratories, hospitals, and nuclear centers. The irritant effects of pollutants on the eyes, nose, and throat were briefly discussed. Foreign legislation was also briefly discussed. Generally, foreign regulations prohibit the emission of gases and smoke above certain pre-established limits, provide vehicle emission standards and regulation of some control equipment. Spanish legislation is scarce and inefficient. Old regulations include provision for industries to emit noxious gases with the consent of sanitation inspectors and weekly atmospheric analyses for chemicals and bacteria. Other old regulations prohibit the establishment of vapor-producing industries within 500 m of a town and a maximum emission limit for sulfur anhydrides at 6 g/cu m. More recent legislation established maximum allowable concentrations for smoke, particulates, sulfur anhydrides, and carbon anhydrides, and an opacity index. The amounts of sulfur allowed in combustible liquids for industrial use were prescribed. Carbon monoxide emissions from vehicles and dust emissions from cement industries were also regulated. It was concluded that public and industrial responsibility and enthusiasm for control should be encouraging and more flexible, realistic legislation should be passed.

B. EMISSION SOURCES

00020

J. R. Goldsmith and L. H. Rogers

HEALTH HAZARDS OF AUTOMOBILE EXHAUST. Public Health Repts., 74(6):551-558, June 1959.

Of the substances which occur in automobile exhaust and their reaction products, hygienic standards have been established for industrial exposure to carbon monoxide, nitrogen dioxide, lead, and ozone. Establishing a full set of levels for community exposures to these substances is very difficult because of the sensitivity of frail or ill individuals, the indeterminate period of exposure, the effect of agents in combination, and the cumulative effect of exposure from other sources, such as cigarette smoking. The hazard of automobile exhaust to the population of a large community will depend, among other things, on the extent and way that vehicles are used, and the meteorology of the area. In the absence of effective control for air pollution from automobile exhaust, the public health hazard should be evaluated. (Author)

00027

A. H. Rose, Jr., R. Corn, P. R. Hornsby, H. R. Allen, and P. W. Kalp

AIR POLLUTION EFFECTS OF INCINERATOR FIRING PRACTICES AND COMBUSTION AIR DISTRIBUTION. J. Air Pollution Control Assoc. 8(4):297-309, Feb.1959.

The relationships between incinerator design criteria and resulting atmospheric contaminant discharges were investigated. Tests were made by burning a fuel of constant composition in a prototype, multiple-chamber incinerator under controlled conditions. Effects of variables were measured by analyzing the flue gases for solids, hydrocarbons, oxides of nitrogen, and CO. The series of tests reported was made to (1) provide information on the relative importance of such variables as stoking and amount of fuel per charge insofar as they affect the production of atmospheric pollutants, and (2) evaluate the chosen levels of variables such as excess combustion air, underfire and secondary air distribution, and fuel charging rate. Production of particulates was highly dependent on the amount of excess combustion air and the percentage of this air entering under the fuel bed. At the 50% excess air level, particulate discharge increased when underfire air was increased from 15% to 30% of the total combustion air. This did not hold true for the 150% excess air level. Reduction of hydrocarbons and CO appeared to be more dependent on the level of excess combustion air available than

on its distribution between overfire, underfire, and secondary air. These pollutants were produced under combustion with 50% excess air but not with 150% excess. Production of oxides of nitrogen depended on the rate of fuel charging, the amount of excess air, and the gas temperature in the ignition zone. (Author)**

000010

W. S. Smith

ATMOSPHERIC EMISSIONS FROM FUEL OIL COMBUSTION (AN INVENTORY GUIDE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-2.) Nov. 1962. 102p.

This review provides a guide for the inventorying and control of emissions arising from the combustion of fuel oil. Information was collected from the published literature and other sources. The report is limited to information on oil used as a source of heat or power (exclusive of process heaters). The data were abstracted, assembled, and converted to common units of expression to facilitate understanding. From these data, emission factors were established that can be applied to fuel oil combustion to determine the magnitude of air-contaminating emissions. Also discussed are the compositions of fuel oils; the preparation and combustion of fuel oil; and the rates of emission, their variables, and their control. (Author)**

000052

MOTOR VEHICLES, AIR POLLUTION AND HEALTH (A REPORT OF THE SURGEON GENERAL TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 86-493, THE SCHERER ACT). Public Health Service, Washington, D.C., Div. of Air Pollution. June 1962. 461 pp.

"Motor Vehicles, Air Pollution, and Health" is a report prepared by the Division of Air Pollution of the Public Health Service as directed by the Congress in Public Law 86-493. The Report is presented in three parts as follows: Part I, Summary--A Review of the Problem; Part II, Effects of Motor Vehicle Pollution on Health; Part III, Air Pollution from Motor Vehicles. Part I summarizes current information and theories of the nature of air pollution resulting from emissions from motor vehicles. It also examines approaches to the reduction of such pollution, and some of the problems associated with control measures. Finally, it presents an appraisal of the biological effects, proven or potential, of such pollution. Part II reviews, in detail, information which has been reported concerning the influence of air pollution on health, with particular reference to the effects from pollution arising from the operation of motor vehicles. The results of mortality and morbidity surveys, of laboratory research, and of other pertinent investigations are given. The responses of vegetation and animals, as well as of humans, to individual contaminants as well as to mixtures, such

as are encountered in the atmosphere, are examined. Part III describes, in some detail, how motor vehicle operation relates to emissions of pollutants, the magnitude of the pollution problem, the nature of chemical reactions in the atmosphere, factors affecting concentrations, methods for reducing pollution, and the subject of ambient air and emission standards.##

00058

A STUDY OF AIR POLLUTION IN THE INTERSTATE REGION OF LEWISTON, IDAHO, AND CLARKSTON, WASHINGTON. Public Health Service, Cincinnati, Ohio, Div of Air Pollution. (999-AP-8.) Dec. 1964. 166p.

As a result of an increasing number of complaints from citizens about reduced visibility, damage to house paint, tarnishing of silver, undesirable odors, and suspected effects of air pollution on health, Idaho and Washington and Lewiston and Clarkston officials requested assistance from the U.S. Public Health Service. Subsequently, the Public Health Service, the two states, and the two cities agreed to undertake a cooperative study; the two cities participated in the study. The purpose of the study was to determine the nature and extent of air pollution in the two-city area and to assemble information to be used as a basis for technical and official action needed to conserve air quality in the area. Because of its unique valley location, the two-city area is susceptible to meteorological conditions conducive to pollutant accumulation. Either city can contaminate the other, and this creates a multi-jurisdictional problem that requires joint and cooperative action to control air pollution. As a first step to solve the problem, an Air Resources Management Council consisting of county, city, and state officials is to be organized. This council will be responsible for planning surveys and studies to determine air quality guides and legislation and administration necessary to control air pollution in this multi-jurisdictional area. The Public Health Service in its advisory capacity will provide technical assistance. (Author)##

00081

R.F. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE). Naval Medical Research Lab., New London, Conn., Bureau of Medicine and Surgery. (Rept. No. 367.) Dec. 10, 1961. 30 pp.
CFSTI; DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects; tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.##

00107

S. S. Griswold

CONTROL OF STATIONARY SOURCES (TECHNICAL PROGRESS REPT. VOLUME 1). Los Angeles County Air Pollution Control District, Calif. Apr. 1960. 191 pp.

As a result of the intensive source control measures administered in Los Angeles County, virtually all industrial operations have been brought within the scope of the air pollution control program. From the melting of metal to the painting of manufactured goods, specific industrial processes and equipment have been subject to air pollution control measures. This volume provides individual discussion of control techniques applied to the most significant stationary sources of air contamination. Certain source emission problems, such as those traceable to the operation of railroad locomotives and ships, are not discussed in this volume in view of the current unimportance of the source. The material reported in this volume generally contains only those developments occurring subsequent to the publication of the Second Technical and Administrative Report on Air Pollution Control in Los Angeles County, 1950-51. (Author)##

00109

A. P. Altshuller

REACTIVITY OF ORGANIC SUBSTANCES IN ATMOSPHERIC PHOTOOXIDATION. Public Health Service, Cincinnati, Ohio. Division of Air Pollution. (999-AP-19.) July 1965. 29 pp.

The organic vapors emitted to urban atmospheres by motor vehicles and other sources of emissions consist not only of paraffinic, acetylenic, aromatic, and olefinic hydrocarbons, but also of aldehydes, ketones, alcohols, phenols, and chlorinated hydrocarbons. To estimate the contribution of each of these classes of compounds to photochemical smog, one must know both their atmospheric concentrations and their relative reactivities in atmospheric reactions. A review of the available literature on concentration levels of organic vapors in urban atmospheres indicates that much more analytical work is needed. The existing data are adequate, however, for the formulation of useful estimates. Reactivities of organic substances in photooxidation reactions can be considered from many standpoints. Rates of disappearance of the organic substances, rates of disappearance of nitric oxide or of formation and disappearance of nitrogen dioxide, and rates or maximum yields of various products such as oxidant or organic nitrates all can be used as chemical measurements of reactivity. Eye irritation, various types of plant damage, and aerosol formation are indicators of reactivity that can be related only to a limited extent to chemical measurements of reactivity. The problems of developing a single index of reactivity are considered. The application of reactivity measurements to automobile exhaust composition, to control devices, and to improvements in atmospheric purity is discussed. (Author)##

00154

Buchman, R. W.; W. S. Pagley, and Jerma O. Barto

EXHAUST EMISSION CONTROL BY CHRYSLER - THE CLEANER AIR PACKAGE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc. 1968, p. 178-191. 16 refs. Also: 90th Congress ("Air Pollution--1967, Part I (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-14, 20-21, 1967, p. 411-434.)

Air pollution problems in California required control of vehicle exhaust emissions. The early development of catalytic converters and direct flame afterburners led to relatively complex mechanisms with substantial added cost to the vehicle. An evaluation of the primary factors affecting exhaust emissions indicated the feasibility of control by engine modification alone. A series of engine modifications were subsequently developed which reduced the exhaust emissions to below the California standard of 275 ppm hydrocarbons and 1.5% carbon monoxide. Both the primary changes were to employ optimum combinations of fuel-air mixture and spark timing at all operating conditions. These changes are known as the "Cleaner Air Package" (CAP). 50,000 mile tests indicated that with normal maintenance the exhaust emissions were stable and remained at a low level. The CAP system was put into production on 1968 model Chrysler Corporation passenger cars and light trucks marketed in California.##

00171

THE CONTROL OF AUTOMOBILE EMISSIONS. (FORD CRANKCASE EMISSIONS CONTROL SYSTEM. FORD THERMACTOR SYSTEM FOR EXHAUST CONTROL.) Ford Motor Co., Dearborn, Mich., Engineering Staff. 1968. 6 pp.

An explanation of both Ford's Engine Crankcase Ventilation and Thermactor Exhaust Emissions Control Systems, complete with schematic drawings of cross-sections of the automobile engines is presented. The rationale for its development, the chemistry involved, and the future implications of the systems are discussed.##

00186

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. 1968. 52 pp.

The contribution of motor vehicle emissions to community-wide air pollution is discussed and related to other factors involved in air pollution such as commercial and industrial sources, the size of the community and source distribution, topographical and meteorological factors, and the degree of control exercised on the sources. In particular, one section of the publication analyzes the different pollutant types emitted from diesel and gasoline engines. Another section discusses the photochemical reactions in the atmosphere known to produce air pollutants.##

00220

J. F. Shanhy, J. J. Henderson, C. I. Harding, and A. L. Danis

AIR POLLUTION IN JACKSONVILLE, FLORIDA (A PILOT STUDY - AUG.-SEPT. 1961). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution (AP-3). Apr. 1963. 65 pp.
GPO; 002-099-0

The objectives of this pilot study were: (1) To develop a preliminary opinion as to whether the city of Jacksonville has a generalized air pollution problem. (2) To determine whether certain pollutants - fluorides and SO_2, were present in the atmosphere in concentrations capable of producing the damage to vegetation that had been experienced in the Jacksonville-Duval County area. To accomplish the first objective, a one-week intensive investigation was carried on in downtown Jacksonville, at Lessing Park, from August 3 to 10, 1961. To accomplish the second objective, additional studies were conducted during the periods August 9 to 12, and September 5 to 13, 1961, in the area in which damage to vegetation had occurred. The two fertilizer plants, located in the industrial area of Jacksonville, were not in production during the first phase of this study. Pollutants sampled in this study included fluorides, SO_2, H_2S, NO_2, nitrogen dioxide, and particulates. As a result of the investigations it was concluded that: (1) Photochemical smog was being produced in the air over Jacksonville. (2) Concentrations of fluorides occurred in certain parts of Jacksonville during the period of the study that could cause damage to sensitive plants. (3) Pollutants from the city of Jacksonville can be transported across the St. John's River. H_2S concentrations measured during this study were not of the magnitude known to cause discoloration of paints containing lead pigments and/or mercury base fungicides. Subsequent to the study, an incident of darkening of paints occurred in the Arlington area. Therefore, it is evident that an H_2S problem exists in this area. SO_2 concentrations observed during this study did not reach levels known to cause damage to vegetation. However, it appears possible for SO_2 concentrations to reach levels during the heating season capable of causing damage to sensitive plants, particularly in localized areas downwind of major sources of SO_2.##

00221

L. E. Head, H. B. Favell, and P. J. Lawther

VEHICLE EXHAUSTS AND HEALTH. Smokeless Air, (London) 198-202, 1966. (Presented at the Royal Society of Health Symposium, London, England, Feb. 16, 1966.)

A brief report is given of three papers on Vehicle Exhausts and Health presented at the Royal Society of Health, London, Feb. 1966. Subjects covered include motor vehicle exhausts, petrol and diesel engine emissions, and problems of controlling such pollutants as hydrocarbons and carbon monoxide.##

00225

V.G. MacKenzie R. Flieger

THE CLEAN AIR ACT AMENDMENTS AND SOLID WASTE DISPOSAL ACT OF 1965 (P. L. 89-272). Health, Education, and Welfare Indicators. Nov. 1965. 15 pp.

The Clean Air Act Amendments and Solid Waste Disposal Act provide important new tools to help forge a comprehensive attack on the growing national problem of community air pollution. Under the Clean Air Act of 1963, the Department of Health, Education, and Welfare has undertaken the formation of a national program for the prevention and control of air pollution. The Amendments to the Clean Air Act and the Solid Waste Disposal Act will enable the Department to carry its efforts further in several of the most critical areas of the complex problem of air pollution.##

00269

H. H. Brice and J. F. Roesler

THE EXPOSURE TO CARBON MONOXIDE OF OCCUPANTS OF VEHICLES MOVING IN HEAVY TRAFFIC. J. Air Pollution Control Assoc. 16(11):597-600, Nov. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1965.)

Carbon monoxide and hydrocarbons were sampled at operator's nose height inside vehicles moving in moderate to heavy traffic in six cities. The samples were integrated over 20 to 30 minutes by collection in Mylar bags. Carbon monoxide and hydrocarbons were analyzed by infrared and flame ionization, respectively, with instruments at the Continuous Air Monitoring Program (CAMP) station in each city. Detector tubes for carbon monoxide were also used to determine 5-minute concentrations at suspected high points in the field. Estimates of traffic density were made. Three types of traffic arteries were considered: 1) heavily traveled, wide expressways, 2) main city streets with moderately rapid vehicular traffic, and 3) center city streets with slow-moving traffic. Integrated half-hour CO concentrations

obtained within the vehicles while in traffic were generally considerably higher than the concurrent concentrations measured at the CAMP sites. In-traffic CO values in all cities sampled exceeded 30 ppm in at least 10% of the integrated samples. The range of city averages was 21 to 39 ppm carbon monoxide and the range of individual integrated samples was 7 to 77 ppm of carbon monoxide. (Author abstract)##

00271

W. F. McMichael and J. E. Sigsby, Jr.

AUTOMOTIVE EMISSIONS AFTER HOT AND COLD STARTS IN SUMMER AND WINTER. J. Air Pollution Control Assoc., 16(9):494-498, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 22, 1966.)

The U. S. Public Health Service, as part of its continuing investigations of automotive emissions, began a study early in 1965 to determine the effects of hot-start and cold-start engine operation on exhaust emissions. This study was conducted in the Cincinnati area in summer and winter ambient temperatures. The effects of hot and cold starts on the mass and composition of exhaust gases were compared. Emissions from the test vehicles were measured in actual traffic with a proportional sampler. The test route was developed in earlier work to represent average urban driving conditions. Data from this study reflect the effects of traffic density, route, and climate on hot-start and cold-start engine operation. (Authors' abstract)##

00288

H. C. Johnson, J. D. Coons, and D. R. Knapp

CAN MUNICIPAL INCINERATORS MEET TOMORROW'S REGULATIONS? Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-131.)

Over the last two decades, Los Angeles, the San Francisco Bay Area, and other West Coast areas have gone far beyond most other parts of the country in the nature and extent of limitations legally imposed on incinerator design and performance. With the increasing population of these areas, and the problems of other solid waste disposal methods, it seems prudent to consider whether additional or tighter limitations may be imposed as rapidly as the technology permits. It is the purpose of this paper to consider briefly some of the implications of these possibilities. It is, therefore, primarily speculative in nature. Present and future standards for incinerator emission control, incinerator performance and design considerations are discussed. (Authors' abstract)##

00119

SURVEILLANCE OF MOTOR VEHICLE EMISSIONS IN CALIFORNIA (QUARTERLY PROGRESS REPT. NO. 1, JULY - SEPT., 1965). California Dept. of Public Health, Los Angeles, Vehicle Pollution Lab. Rpet. 1965. 77 pp.

The 1966 model automobiles which are sold and registered in California must be equipped with exhaust control systems or control devices which will meet California standards for the emissions of hydrocarbons and carbon monoxide. Although all control systems were thoroughly tested prior to certification these tests were performed on a limited number of preproduction model cars and their performance in the hands of the general public may differ substantially from that of the earlier test vehicles. Moreover, since the maintenance requirements recommended by the car manufacturers are not enforceable by law, the effects of quality and frequency of voluntary maintenance on emission levels need further study. Under the Federal surveillance Grant the above conditions will be investigated on a large sampling of cars at 3 separate surveillance test stations in the Southern California area, each equipped with a chassis dynamometer and an analytical sampling train for the accurate determination of emission levels. The 1966 model vehicles equipped with exhaust control systems were not available for testing during this report period. However, test data were obtained and compiled on 2 groups of fleet vehicles. In general, both groups of vehicles were driven in a manner considered representative of the type of driving expected of private owners. Servicing of the fleet vehicles may have been different from the maintenance procedure of private owners. Results of the survey are expressed in both tabular and graphic form for cold and hot starts showing the changes in emission levels of hydrocarbon and CO with respect to mileage accumulation and/or engine adjustments. The data are presented in categories by manufacturer, State-owned Fleet, General Motors Corp., Ford Motor Co., American Motors, International Harvester, Kaiser-Willys. Data derived from the testing of the fleet vehicles will provide a basic reference pattern for comparing fleet-maintained vehicles with: (1) the 1966 assembly line production models (with control system) sold to private owners in California; (2) the 1965 unequipped vehicles maintained by the general public.##

00124

G. C. Hass, F. Bonamassa, P. Heward, H. Rayne

THE INFLUENCE OF VEHICLE OPERATING VARIABLES ON EXHAUST EMISSIONS. J. Air Pollution Control Assoc. 17(6) 384-7, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-69.)

This paper is a report of the operating variables and emission characteristics of a 1964 283 cubic inch V-8 Chevrolet

automobile. This vehicle was used as a laboratory tool in a project to develop an improved driving cycle to represent Los Angeles peak hour driving. As a result it became necessary to run many exploratory tests to determine the relationships between the primary variables of intake manifold vacuum, engine rpm, and vehicle speeds and acceleration rates. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides were also determined for the entire range of operating conditions. The effect of prior operating modes on closed-throttle unburned hydrocarbon concentrations was also determined. The results of these tests are presented in tables and graphs which make a comprehensive picture of one typical automobile as a generator of air pollutants. (Author's abstract)##

00137

W. B. Crouse and H. E. Flynn

SOURCE INVENTORY IBM SYSTEM FOR PARTICULATE AND GASEOUS POLLUTANTS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-10.)

A source inventory IBM system of air pollutants is described which makes use of an existing IBM card index-registration system in an established air pollution control district and which employs efficient utilization of engineering time, including computer services, to establish and maintain current a detailed source inventory of point sources of emissions. An emission inventory specifies the (1) amounts, and (2) sources of air pollution in a community. The knowledge of air pollution can be relegated to three simple questions: (1) "What" the pollution problem is in terms of primary air pollutants; (2) the "where" of the problem -- i.e., a description of the industrial, commercial, or domestic sources by tabulation of either (a) types and location of basic equipment discharging pollutants, (b) a description in broad source categories of industry, or (c) actual tabulation of locations of plants in the community, and (3) the "how much" or extent of air pollutants. In the case of gases, namely organic compounds, the oxides of nitrogen and sulfur, and CO, future regulation and enforcement of invisible gaseous emissions requires an inventory which predetermines or estimates levels of emissions and directs enforcing officers or inspectors to point locations. This capability is discussed as well as the description of the method of construction of a recent source inventory, calculated on the basis of average emission factors and known plant throughput data and plant locations (registered plant equipment).##

00175

R. A. Prindle

AIR POLLUTION AND COMMUNITY HEALTH (CHAPTER EIGHTEEN). Medical Climatology 505-18, 1966.

In this chapter author reviews major pollution episodes which have occurred since 1930 in various parts of the world. These episodes have demonstrated the danger and the lethality that may result when certain meteorologic phenomena occur in geographical areas where potentially high concentrations of air pollutants may form. Certain pollutants that might be tolerated in low concentrations in some inhabited areas might become dangerous when mixed with pollutants from other sources that could exert an accentuating or synergistic action. SO_2, particulates, CO, beryllium, lead, fluoride, photochemical, and allergenic pollutants and their effect on man and animals are discussed. The most important animal experiments as well as other research are reviewed.##

69179

G. A. Jansen and D. F. Adams

ABSORPTION AND CHLORINE OXIDATION OF SULFUR COMPOUNDS ASSOCIATED WITH KRAFT MILL EFFLUENT GASES. Preprint. 1966.

Absorption of methyl mercaptan and H_2S into aqueous solutions of Cl, NaOH, and Cl plus NaOH has been studied using a 2 in. diameter absorption column packed with 1/4 in. Intalox saddles. Absorption rates were noticeably affected by chemical reactions occurring in aqueous Cl and OH media. Potentiometric methods were used to follow the reactions of mercaptan and sulfide in aqueous chlorine solutions. Mercaptan apparently was converted by aqueous Cl absorption media to dimethyl disulfide and stripped off in the effluent gas. The percentage conversion increased with increasing pH. The absorption of H_2S in aqueous Cl (pH 2 to 13) was highly pH dependent. The absorption rate increased slowly as the pH of the feed solution increased to pH 11. Sulfate was the resulting oxidation product. At pH 11, the rate of absorption dropped slightly, then rose sharply at pH 12. Elemental S became the major product at pH 12 and above and fouling of the packed column occurred. The effect of pH on formation of sulfate and/or elemental S in chlorine-sulfide reactions was explained by Chaplin and Faulkenberry (1937). The absorption of sulfide in aqueous NaOH increased until the feed hydroxide to sulfide ratio was 1. At higher ratios, the absorption rate remained constant. Apparently, sodium bisulfide was the absorption product. The results of these studies indicate that aqueous Cl solutions at pH above 12 can be effectively used for removal of H_2S in absorption equipment designed to handle S in suspension. The absorption of methyl mercaptan in aqueous Cl solution appeared to be impractical since dimethyl disulfide was apparently the only product formed and was stripped from the tower by the gas stream. Hydroxide solution was effective for absorption of both methyl mercaptan and H_2S when hydroxide to sulfide or mercaptan feed ratios were greater than 1 or 1.8 respectively. (Author)##

00108

E. C. Tabor

CONTAMINATION OF URBAN AIR THROUGH THE USE OF INSECTICIDES.
Trans. N.Y. Acad. Sci. 28(5) 569-78, Mar. 1966.

Results of this investigation show that the air over many communities is contaminated with substantial amounts of a wide variety of insecticides. The concentrations observed represent minimum values, since the sampling method did not collect pesticide vapors and some of the collected aerosols could have been lost by vaporization during the sampling period. These minimum values, nevertheless, demonstrate that the ambient air can be a route for the nonoccupational exposure of people to insecticides. The actual significance of this route requires considerable further definition, particularly with respect to the total pesticide concentrations. Before total air-borne pesticide concentrations can be determined and potential physiological effect on humans, flora, and fauna evaluated, suitable methods must be developed for the simultaneous collection of both aerosol and vapor forms and for subsequent analysis of the resulting samples. Levels reported herein indicate the need for the development of improved techniques and the further definition of the ambient air concentrations. (Author) PP

00468

C.P. Ellis

CHEMICAL ANALYSES OF AUTOMOBILE EXHAUST GASES FOR OXYGENATES.
Bureau of Mines, Washington, D.C. (Dept. of Investigations No. 5822). 1961. 39 pp.

This report presents procedures for chemical analyses of certain oxygenated compounds, procedures for sampling the exhaust gases for these analyses, and the analytical results of some experimental work in which these procedures were used. A stationary 1956 model, 170 horsepower, V-8, dynamometer-mounted engine, operated to simulate vehicular cruise conditions, was used for the study. Exhaust gases produced from a regular-grade Midcontinent gasoline during 15-, 40-, and 60-mile-per-hour cruise operations were analyzed by chemical methods for formaldehyde, total aldehydes, total carbonyls, total alcohols, carbon associated with the oxygenated compounds, and the oxides of nitrogen. Experimental results indicate: (1) The range of concentrations of the total of the functional groups of oxygenated compounds, expressed as moles per million moles of water-free exhaust gases, is about 90-100; the concentrations increase with engine speed; (2) Aldehydes comprise about 80-90 mole-percent of the total of the oxygenated groups, and formaldehyde accounts for about 50 mole-percent of the total aldehydes; (3) The order of magnitude of the concentration of the carbonyls is the same as that for the aldehydes, indicating that ketones are not a major group. A colorimetric test indicates that methyl ketones constitute about 2 mole-percent of the oxygenated compounds;

(4) The concentration of the alcohols is of the order of 10 mole-percent of the oxygenated compounds; (5) The total carbon associated with the oxygenated compounds is about 175 moles per million moles of water-free exhaust gas for all 3 speeds; and (6) The concentration of N oxides, expressed as moles of NO2 per million moles of water-free exhaust gas, is about 150, 1,600, and 2,800 at 15, 40, and 60 miles per hour, respectively.##

00504

D.A. Jensen

SEPARATING FACT FROM FICTION IN AUTO SMOG CONTROL. Arch. Environ. Health, 14(1):150-155, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

Author gives a status state-of the -art summary of the various sources of emissions from automobiles. Topics covered are: crankcase emission controls; servicing and maintenance; requirement of a "closed" system or one equally effective, exhaust emission controls; evaporative emissions; oxides of nitrogen emission controls; diesel smoke and odor emission controls; cars and fuels of the future. In addition, author discusses the impending vehicle emission control which will be put into effect for 1968 motor vehicles.##

00566

W. L. Faith

ECONOMICS OF MOTOR VEHICLES POLLUTION CONTROL. Chem. Eng. Progr., 62(10):41-43, Oct. 1966. (Presented before the Symposium on Economics of Air Pollution Control, 59th National Meeting, American Inst. of Chemical Engineers, Columbus, Ohio, May 15-18, 1966, Paper No. 24 G.)

The cost of air pollution control devices to the motorist, for the reduction of hydrocarbons, carbon monoxide and nitrogen oxides in general and per smog day, are discussed. Cost of the device, of the installation and cost of maintenance are calculated. Results are summarized in tables.##

00592

T. A. Huls, F. S. Myers, and D. A. Uyehara

SPARK IGNITION ENGINE OPERATION AND DESIGN FOR MINIMUM EXHAUST EMISSION. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 71-91. 28 refs. (Presented at the Society of Automotive Engineers Meeting, June 6-10, 1966.

The purpose of the tests conducted on a single-cylinder laboratory engine was to determine what can be done in the design and operation of a spark-ignition engine to minimize emission of air pollutants. For the engine used in this study, the exhaust emissions were found to have the following dependence on various engine variables. Hydrocarbon emission was reduced by lean operation, increased manifold pressure, retarded spark, increased exhaust temperature, increased coolant temperature, increased exhaust back pressure and decreased compression ratio. Carbon monoxide emission was affected by air-fuel ratio and premixing the charge. NO and NO2 emission is primarily a function of the O2 available and the peak temperature attained during the cycle. Decreased manifold pressure and retarded spark decrease NOx emission. Hydrocarbons were found to react to some extent in the exhaust port and exhaust system. This reaction appears to follow the Arrhenius rate equation relationship. Calculations of theoretical HC concentrations were made based on quench theory using measured combustion pressures and surface temperatures. It was assumed that the only source of HC's in the exhaust is the quench volume, i.e., the thin layer adjacent to the chamber walls through which the flame does not propagate. The difference between actually measured HC emission levels and the levels that quench theory predicts is resolved by assuming 2/3 of the contents of the quench volume leave the engine and Arrhenius type reaction during the exhaust portion of the combustion cycle. It was also concluded that the HC's left unburned after flame passage in the combustion chamber are proportional to the area swept by the flame per unit charge. (Authors' abstract)##

00621

D.d. Von Lehmden, R. P. Hangebrauck, J.E. Meeker

POLYNUCLEAR HYDROCARBON EMISSIONS FROM SELECTED INDUSTRIAL PROCESSES. J. Air Pollution Control Assoc. Vol. 15(7):306-312, July 1965.

A number of selected industrial processes considered as potential sources of benzo(a)pyrene and other polynuclear hydrocarbons was surveyed. Polynuclear hydrocarbon emission levels were measured directly for asphalt hot road mix preparation and asphalt air blowing. Emissions of other pollutants, including particulate matter, carbon monoxide, and total gaseous hydrocarbons were also measured, and are reported together with pertinent data on process design and operation. Results are discussed with reference to the type of process; the type of equipment used, including control devices; and other factors. The significance of some additional processes as contributors of polynuclear hydrocarbons was examined indirectly by collecting atmospheric samples of polynuclear hydrocarbons in residential areas in the vicinity of (1) a carbon black manufacturing area, (2) a steel and coke manufacturing area, (3) an organic chemical industry complex, and (4) a residential and small-industry coal burning area. (Author abstract)##

00650

R.C. Battigelli

EFFECTS OF DIESEL EXHAUST. Arch. Environ. Health Vol. 10(2):163-167, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Over the past three years the author's work at the School of Public Health in Pittsburgh has been directed to the possible detrimental effects brought about through exposure to diesel motor exhaust. Attention was directed to railroad workers employed in locomotive repair shops. Neither respiratory complaints nor impaired pulmonary function, could be related to this type of occupational exposure. As a second phase in this investigation, volunteers were exposed to diesel exhaust gas for short periods and pulmonary resistance was measured. The levels utilized for these controlled exposures are comparable to realistic values such as those found in railroad shops. No effect could be measured in these volunteers after they had been exposed at these varying levels of pollution from diesel exhaust for short periods up to one hour.**

00673

R.H. Hovey, A. Wisman, J.F. Cunnane

THE DEVELOPMENT OF AIR CONTAMINANT EMISSION TABLES FOR NONPROCESS EMISSIONS. J. Air Pollution Control Assoc. Vol. 16(7):362-366, July 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-17.)

In New York State, the calculation of air contaminant emissions from a variety of sources is an essential part of comprehensive air pollution studies. The tables used to calculate emissions were obtained from an extensive literature search and modified to apply to New York State conditions. For example, sulfur dioxide emission factors for coal were selected to reflect the average sulfur content of the coal sold in New York State. Since the literature contains a wide array of emission factors,**

00679

W. E. Jackson

AIR POLLUTION FROM AUTOMOBILES IN PHILADELPHIA. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-137.)

This report has been prepared with the objectives of describing the problem created by automobiles in Philadelphia and recommending the action which must be taken. The action

recommended is as follows: (1) Positive crankcase ventilation systems and exhaust control systems should be required on all new cars registered in Pennsylvania. A well planned program of controlling only the new cars with factory installed devices will minimize the problem over a ten year period, if initiated immediately, this reasonable approach would eliminate the need for a crash program at some future date. All mechanical devices require maintenance to insure proper and efficient operation; and (2) The State-wide inspectional system should require a maintenance check of all appropriate parts of the automobiles to insure satisfactory operation (as related to pollution emissions) and to reject those cars with visibly excessive exhaust emissions. This should apply to both new and used automobiles and all other types of motor vehicles.##

00746

R. Piper

THE HAZARDS OF PAINTING AND VARNISHING 1965 . Brit. J. Ind. Med. (London) 22(4):247-266, Oct. 1965.

A review of paint hazards is made, giving brief descriptions of methods of application in use in 1965, of paint usage according to resin base, and of paint ingredients. The most interesting and complex of these are the resin bases, which have much in common with plastics. Reference is made to some of the many minor ingredients. The problem of keeping abreast of the possible toxic effects, so that paint manufacturers and their customers may be warned and protected is emphasized. (Author's abstract)##

00798

R.I. Larsen

VEHICLE EMISSIONS AND EFFECTS, A SUMMARY OF THE DECEMBER 1961 AIR POLLUTION RESEARCH CONFERENCES. Preprint. (Presented at the New England Section Annual Meeting, Air Pollution Control Association, Worcester, Mass., Apr. 25, 1962).

In December 1961 air pollution research findings to that date were presented at two conferences held in Los Angeles. The conferences were the Fifth Air Pollution Medical Research Conference and the Joint Research Conference on Motor Vehicle Emissions and Their Effects. A few highlights follow. Air pollution damages plants, animals, and property, and is harmful to people. Plant damage in the United States exceeds $25 million per year. Present community air pollution levels weaken an individual's resistance to respiratory diseases such as colds, pneumonia, and lung cancer. Smoking and air pollution age and deteriorate lungs. In one study, smokers' lungs aged 50% faster than non-smokers' lungs. In another study, 90% of heavy smokers (more than two packs per day) had respiratory disease. The disease rate for several respiratory ills was 3 to 5 times greater in these heavy smokers than in individuals who had

never smoked. The death rate from emphysema (deteriorated lungs) has increased 600% in the last 10 years. A recently identified photochemical pollutant, peroxyacyl nitrate (PAN), at concentrations as low as 5 parts per billion (ppb), damages plants. It is quite possible that this pollutant is responsible for most "oxidant-type" damage in Los Angeles. Five times as much exhaust gas from low-olefin fuel was required to produce similar damage. Russian air quality standards probably have at least one present use in the United States. In a given community, pollution concentrations that do not exceed the Russian standards tentatively could be considered to not be problems. The contribution of the internal combustion engine to smog could be reduced significantly by improved carburetor design, improved production control, and improved carburetor and ignition system maintenance. If the conventional engine without an afterburner is considered beyond redemption, a lean-fuel engine (such as gas urbine, stratified charge, or diesel) could be used to meet present emission standards. If an automobile that does not contribute to smog is to be achieved, a new sense of mission, a lot more money, and additional competent researchers will be required. (Author abstract modified)##

00835

B.P. Gourinoff

CARCINOGENIC SUBSTANCES IN THE AIR OF CITIES AND POSSIBLE PREVENTIVE MEASURES. Acta, Unio Intern. Contra Cancrum, Vol. 19, 737-738, 1963.

Cancerogenic properties as identified in emissions from motor vehicles, fuels, and industrial exhaust, are considered an important factor in human cancer epidemiology. This paper reviews briefly studies at home and abroad. Exhaust from carburetor and diesel engines are compared, and other sources of carcinogenic properties investigated. It is briefly mentioned that use of coal tars for road surfacing is prohibited in the U.S.S.R.##

00895

V.I. Lur'e

[STUDY OF THE HARMFUL INDUSTRIAL EXHAUSTS IN THE ATMOSPHERE IN THE SYNTHETIC RUBBER PLANTS IN VORONEZH AND YEFREMOV.] Obsledovanie Vrednykh Proizvodstvennykh Vybrosov v Atmosferu na Voronezhskom i Efremovskom Zavodakh SK. Kauchuk i Rezina No. (3):36-37, 1966. Text in Russian

Waste emissions both in the factory area and in the hygienic control zone around it (300-500 m from the factory) were studied both qualitatively and quantitatively. While pollution did not exceed the established limits in the factory areas, it did in the control zone surrounding the factories. Contaminants were butadiene, isobutylene, styrene, benzene and ethanol vapors. Most of the pollution was caused by styrene-

butadiene rubber processing in the belt casting machine. large amounts of hydrocarbons were given off by shops producing isoprene and latex. Pollution of the surrounding air also came from exhaust ventilation of the factories and open pits of chemical waste. This resulted in a fall of 1200 metric tons in Voronezh and 700 tons in Efremov per year. Measures for the control of exhaust ventilation from the factories are urged.##

00905

O. Buchta

HYGIENIC CONDITIONS ON MOLDING POLYESTER GLASS REINFORCED PLASTICS. Hygienicke Pomery Pri Lisovani Polyesterovych Skelnych. Plasticke Hoty Kaucuk (Prague), 3(6):177-182, 1966.

Hygienic problems associated with the manufacture of polyester glass reinforced plastics are discussed. Results are given for the polarographic measurement of styrene vapor concentration in the atmosphere of the general pressing room and the hand pressing room.##

00962

R. J. Larsen

AIR POLLUTION FROM MOTOR VEHICLES. Ann. N. Y. Acad. Sci., 136(12):275-301, Aug. 26, 1966. (Presented at a meeting of the New York Academy of Sciences, April 6, 1966.)

Motor vehicles are a major source of urban air pollution. They emit carbon monoxide that reduces man's ability to transport oxygen to his tissues; lead that increases man's body burden of this toxic metal; cancerigenic hydrocarbons; and reactive hydrocarbons and nitrogen oxides that combine with sunlight to produce eye-irritating, plant-damaging, visibility-obscuring photochemical smog in New York as well as in California. Present and predicted air pollutant concentrations are compared with pollutant effects and air quality standards. Emission-reduction features presently used in new cars sold in California will improve air quality, but will not completely solve the problem. Indications are that 95 percent reduction in emissions of carbon monoxide, hydrocarbons, and nitrogen oxides from new cars sold in the United States may be needed by 1975. Such a "clean-air car" by 1975 is suggested as a research goal for automobile manufacturers. At present, improved fuel cells or improved battery power seem to be the most likely means for achieving this goal. (Author abstract)##

00969

F: A. Leighton

MAN AND AIR IN CALIFORNIA. Preprint. (Presented at the Statewide Conference on Man in California, 1980's, Sacramento, Calif., Jan. 27, 1969.)

Author discusses polluted air in respect to automobile emissions and projects the concentrations that can be expected by 1980. Presented are charts and tables which easily delineate the salient points of the article.##

00972

R: Mayer

A COMPILATION OF AIR POLLUTANT EMISSION FACTORS FOR COMBUSTION PROCESSES, GASOLINE EVAPORATION, AND SELECTED INDUSTRIAL PROCESSES. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, May 1965, 51 p.

The source emission factors presented in this report were compiled primarily for use in conducting an air pollutant emission inventory. The compilation is the result of an extensive literature survey and includes emission factors for the principal combustion and industrial processes. Obviously, the best emission factor to use for any specific source of air pollution is that resulting from source tests of the specific source. Unfortunately, many urban areas are not equipped to conduct the numerous and expensive stack testing studies needed for an emission inventory. The purpose of this compilation of emission factors is to provide the best available substitute to air pollution control agencies unable to conduct extensive source test programs. In certain cases, particularly in the combustion and refuse disposal areas, a single number is presented for the emission factor for a specific pollutant. It should be understood that the number is usually a weighted average of several different values found in the listed references. The compilation of source emission factors presented is, in our judgment, the most accurate currently available. As new technical advances are made, however, and additional emission data become available in the literature, the present compilation should be revised to reflect the newer data and developments.##

00975

R: I. Weisburd, (Compiler and Ed.)

AIR POLLUTION CONTROL FIELD OPERATIONS MANUAL (A GUIDE FOR INSPECTION AND ENFORCEMENT). Public Health Service, Washington, D. C.; Div. of Air Pollution, 1962. 291p.

Author discusses sources, control methods, training techniques and related aspects of air pollution. Document is an

excellent source for specific information on equipment being used in air pollution control. Pictures, diagrams, schematics and charts are given.##

00985

B.B. Waller, B.T. Cousins, P.J. Lauther

AIR POLLUTION IN A CITY STREET. Brit. J. Ind. Med. (London), Vol. 22:128-138, 1965.

Measurements of the concentrations of smoke, lead, and five polycyclic hydrocarbons in the air have been made in the City of London in the middle of a busy street and at two control sites. Samples were taken only throughout the daytime hours on weekdays to enable us to assess the maximum contribution made by traffic to the pollution in the street. The results showed that during these periods the air in the middle of the street contained three times as much smoke, four times as much lead, and 1.7 times as much 3:4-benzpyrene as were present in the general atmosphere of the City of London as estimated from samples taken at the control sites. One of these sites was chosen because it was only 150 feet from the street; analyses yielded no evidence that the traffic contributed to the pollution sampled there. Sulphur dioxide concentrations were determined in the early part of the study and the results showed that traffic appeared to add little to the background level. The concentrations of lead found were below those held to be safe by many authorities. Carbon monoxide concentrations, reported in greater detail elsewhere, sometimes reached the accepted industrial maximum allowable concentration of 100 ppm. (Author abstract)##

01008

S. R. Ray and R. Long

POLYCYCLIC AROMATIC HYDROCARBONS FROM DIFFUSION FLAMES AND DIESEL ENGINE COMBUSTION. Combust. Flame 8, 119-51, June 1964.

A study has been made of the effects of air flow rate and of several additives to the fuel of a laminar diffusion flame on the formation of: (1) soot, (2) carbonaceous residue (i.e. chloroform insoluble material), (3) pentane-soluble material (shown to be essentially polycyclic aromatic hydrocarbons), and (4) 3,4-benzpyrene contained in the latter. Increasing air flow rate leads to a decrease in both soot and carbonaceous residue which reach limiting values. Pentane-soluble material and 3,4-benzpyrene decline continuously with increase in air flow rate but at a diminishing rate. Dichloromethane as additive increases the formation of soot and carbonaceous residue to a considerable extent without having any appreciable effect on the formation of pentane-soluble material and 3,4-benzpyrene. Nitromethane, 1-nitropropane, ethyl nitrate and t-butylhydroperoxide all bring about significant reductions in the formation of chloroform-soluble material, including pentane-soluble material and 3,4-benzpyrene.

Total soot formation is reduced slightly but the formation of carbonaceous residue is virtually unaffected. Similar results are obtained in a study of the particulate matter in diesel exhaust when the additives are blended with a diesel fuel, and conditions of inefficient operation are simulated. t-Butylhydroperoxide is found to be most effective in reducing the formation of 3,4-benzpyrene. Both the diffusion flame and diesel engine results are in conflict with the hypothesis that carbon formation occurs through polycyclic aromatic hydrocarbons as intermediates; these may be the end products of side-reactions, probably free-radical in nature. (Author abstract)##

01038

L. J. Goldwater, A. J. Nosso, and N. Kleinfeld

BLADDER TUMORS IN A COAL TAR DYE PLANT. Arch. Environ. Health Vol. 11:811-817, Dec. 1965.

This study was undertaken in order to assemble additional information on the occurrence and natural history of malignant tumors in workers exposed to coal tar dyes and dye intermediates. Specific points to be investigated were: 1. To determine the incidence of urinary bladder tumors, especially in workers exposed to beta-naphthylamine, benzidine, and alpha-naphthylamine. 2. To establish the "incubation" period from the start of exposure to the onset of first genitourinary complaints suggestive of bladder tumor. 3. To establish survival time after diagnosis of bladder tumor. 4. to determine the incidence of malignant tumors other than those of the bladder. The major conclusions from this study of the records of 308 male employees in a coal tar dye factory are: 1. The incidence of malignant tumors of the bladder was 26.2%. 2. The time elapsed from first exposure to first abnormal signs or symptoms ranged from 1 to 35 years, with a mean of 18.4 years. 3. The time elapsed from first exposure to diagnosis of bladder malignancy ranged from 2 to 42 years, with a mean of 22.9 years. 4. The mean survival time following diagnosis of bladder malignancy was about three years for all types of exposure except beta-naphthylamine alone for which it was about eight years. 5. There was no evidence of any unusual incidence of malignancies other than those of the urinary bladder. 6. The findings were similar to those reported by other observers.##

01059

P.J. Lauther, R.T. Cousins, R.E. Waller

A STUDY OF THE CONCENTRATIONS OF POLYCYCLIC AROMATIC HYDROCARBONS IN GAS WORKS RETORT HOUSES. Brit. J. Ind. Med. Vol. 22:13-20, 1965.

Measurements of the concentration of 3,4-benzpyrene and other polycyclic aromatic hydrocarbons have been made in gas works retort houses of several types. The tarry fumes which escaped from retorts contained extremely high concentrations of polycyclic hydrocarbons, but in general men were only

exposed to these very briefly. The mean concentration of 3:4-benzpyrene determined from long-period samples at sites representative of normal working conditions in three works was 3 micro g./cu.m., over 100 times the normal level in the City of London. Above the retorts in an old horizontal retort house the concentration was over 200 micro g./cu.m., about 10,000 times that in the city, and the "top-man" working there could be exposed to this in the normal course of his duty. The authors found no working areas in the vertical retort houses where men could be exposed to such massive concentrations of polycyclic hydrocarbons. Apart from defining these special conditions above horizontal retorts the results did not reveal any gross differences in pollution of the general air in horizontal and continuous vertical retort houses. (Author abstract)**

01076

E. F. Darley, F. H. Burlesson, E. H. Hatuer, J. T. Middleton, and V. P. Osterli

CONTRIBUTION OF BURNING OF AGRICULTURAL WASTES TO PHOTOCHEMICAL AIR POLLUTION. J. Air Pollution Control Assoc, Vol. 16(12):685-90, Dec. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966.)

Agricultural wastes from orchards, grain fields, and range lands are burned each year in California as the most practical means of ridding the land of these wastes. In order to determine the relative contribution of the burning of such material to photochemical air pollution, the effluent from 121 fires of known weights of range brush, both dry and green, barley and rice stubble, and prunings from various fruit and nut trees were monitored in a special tower which provided an open burning situation. Analyses were made for total hydrocarbon, expressed as C, by flame ionization detection, and for 20 individual hydrocarbons by gas chromatography, as well as for CO and CO2 by infrared spectroscopy. A few analyses were made for oxides of nitrogen. These data, coupled with temperature and airflow measurements, allowed calculations to be made on pounds of effluent per ton of material burned and demonstrated that the emissions from agricultural burning are much less than those from the automobile, a principal source of such emissions. (Author abstract)**

01132

G. W. Hispath and S. H. Rich

THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM FOR THE CONTROL OF EXHAUST EMISSIONS . Gen. Motors Eng. J., 13(3):30-39, 1966.

The Air Injection Reactor (AIR) system developed by General Motors, and initially applied on most 1966 GM car and light truck models produced for sale in California, provides an effective means for controlling hydrocarbon and carbon monoxide exhaust emissions without a sacrifice in automotive performance.

The AIR system, which meets California standards for emission control, is basically simple in operation. Fresh air is injected into the exhaust ports of an engine to provide complete burning of hydrocarbons and carbon monoxide in the exhaust manifold. The development of the system, however, involved much design effort and testing to prove its effectiveness, reliability, and durability. System components, including a specially-designed air pump, had to be designed to be compatible with all engine-carburetor-transmission combinations used in GM car models. In addition, the AIR system had to be designed to require minimum maintenance. (Author summary)**

01133

W. R. Thompson

THE DESIGN AND DEVELOPMENT OF THE AIR PUMP FOR THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM. General Motors Engineering J., 13(3):30-35, 1966.

The development of the General Motors Air Injection Reactor system for controlling the concentrations of unburned hydrocarbons and carbon monoxide in vehicle exhaust emissions required engine modifications and the design of new components. The most vital component in the system is the air pump, designed and manufactured by the Saginaw Steering Gear Division. The pump developed by Saginaw engineers is a semi-articulated vane type positive displacement pump. The design displacement is 19.3 cu in. per revolution with high volumetric efficiency and low horsepower consumption. Additional design criteria included durability consistent with the life of the vehicle and satisfactory performance without maintenance. (Author summary)**

01165

R. B. Holland

AIR QUALITY CONTROL BY PETROLEUM REFINERS. Preprint. (Presented at the Third Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Vancouver, British Columbia, Nov. 3-4, 1960.)

Air quality can best be maintained by controlling pollution on a regional basis. Close cooperation between the technical staffs of the province, municipalities and industries in the region is required to achieve the best solution to the regional problem. Means are available to control the emissions from petroleum refineries to the degree required by our current understanding of the problems.**

01228

L. Napier and C. R. Hose

VENTILATION FOR ENGINE EXHAUST GASES. Occupational Health Rev. Ottawa 17, (4) 19-22, 1965.

Engine exhaust gases are capable of affecting health in varying degrees, and confusion as to their relative importance often arises. This is partly because most exhaust analyses are reported only as concentrations within the exhaust system, without specifying the total exhaust volume. For clarification, a comparison is made of the actual amounts in which these components are emitted from various engines. These data exemplify the difference in ventilation requirements for diesel engines and gasoline engines. The toxic effects of carbon monoxide and some basic ventilation considerations are outlined. (Author abstract)

01362

R.R. Dishi E.A. Zavadski

CONTAMINANTS IN FLUE GASES - AND METHODS FOR REMOVAL. Coal Age, Vol. 70:70-76, Dec. 1965. (Presented at Technical Sales Conference, National Coal Association and Annual Meeting of Bituminous Coal Research, Inc., Sept. 1965.)

The relative importance of the harmful pollutants in stack gases from coal combustion is described. Polynuclear hydrocarbons, oxides of nitrogen, particulates, and sulfur oxides are considered. Sulfur dioxide removal methods are described.

01375

R.S. Starkman H.R. Newhall

CHARACTERISTICS OF THE EXPANSION OF REACTIVE GAS MIXTURES AS OCCURRING IN INTERNAL COMBUSTION ENGINE CYCLES. California Univ., Berkeley, Dept. of Mechanical Engineering, 1965, 13 p. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 17-21, 1965, Paper No. 650509.)

The influence of nonequilibrium in the expansion gases of spark ignition engines has been studied theoretically to determine how power output and exhaust gas composition might be affected. Comparing a gas which is frozen in composition during expansion with a composition which continuously is in equilibrium shows the difference in expansion work can be as large as 10%. Maximum influence is in the fuel-air ratio range of chemically correct mixtures. It was found that carbon monoxide and nitric oxide concentrations in the exhaust more nearly reflect the frozen composition than the equilibrium expansion. This is particularly true for the range of mixture ratios - from lean to chemically correct.

01381

R.W. Burn

COMPREHENSIVE ANALYSES OF AUTOMOTIVE EXHAUSTS. Arch. Environ. Health, Vol. 5:594-598, Dec. 1962. (Presented at the session on Constituents of Motor Vehicle Exhaust at the Air Pollution Research Conferences, Los Angeles, Calif., Dec. 5, 1961.)

The nature of the gaseous or volatilized components of automotive exhaust is reviewed. Recent work conducted to define more precisely variations in exhaust-gas stream composition is reported. Information on the simultaneous occurrences of the several classes of components is presented. Analytical methods; inert, reactive, and noxious constituents; and hydrocarbon measurements are considered.##

01382

B.W. Hurn, T.C. Davis

GAS CHROMATOGRAPHIC ANALYSIS SHOWS INFLUENCE OF FUEL ON COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. Proc. Am. Petrol. Inst. 38(3):351-375, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Institute's Division of Refining, Los Angeles, Calif., May 12, 1958.)

Chemical differences in the exhaust products from different fuels; and the effect of engine speed and load on these differences are reported. Experimental data were obtained with the use of a late model automotive V-8 engine on a dynamometer block. Fuels which were used included pure isooctane, commercial LPG (butane and propane, separately), and seven gasoline stocks from different refining processes. Analytical data obtained by gas chromatography show that exhaust composition varies with engine speed and load according to consistent trends. These trends are influenced by fuel composition, and the degree of fuel influence depends upon mode of engine operation--some basic fuel characteristics are more heavily reflected in the exhaust than are others. Generally, differences in the composition of exhausts from different fuels are quantitatively small, but they are reproducible. (Author abstract modified)##

01383

B.W. Hurn, T.C. Davis, P.E. Tribble

DO AUTOMOTIVE EMISSIONS INHERIT FUEL CHARACTERISTICS? Am. Petrol. Inst.; Proc 40(3):352-357, 1960. (Presented at the 25th Midyear Meeting, American Petroleum Institute's Division of Refining, Detroit, Mich., May 11, 1960.)

In general, the composition of the hydrocarbon component of exhaust produced during engine deceleration is closely related to the fuel. However, during acceleration and cruise the hydrocarbons emitted may be quite dissimilar to the fuel. In this latter instance the amount of olefin emitted bears no direct relation to fuel olefin. Moreover, reduced fuel olefin with increased paraffinicity generally results in increased emissions of olefin. In all engine cycles, the aromatic content of the exhausts follows the aromatic content of the fuel. Thus, hydrocarbons which are emitted inherit the fuel's characteristics during only a portion of the average driving cycle. During the remainder of the cycle many of the original fuel characteristics are erased and the emissions become no more than characteristic mutations. (Author abstract modified)##

01384

R.W. Hurn, C.L. Dozois, J.G. Chase, C.F. Ellis, F.E. Ferrin

THE POTPOURRI THAT IS EXHAUST GAS. Proc. Am. Petrol. Inst., 42(3):657-664, 1962. (Presented at the 27th Midyear Meeting, American Petroleum Institute's Division of Refining, San Francisco, Calif., May 17, 1962.)

Information concerning the myriad compositions and hydrocarbon distributions that accompany changes in engine mode and that define the variable character of an exhaust gas stream is given. Data were obtained on exhaust gases produced using an engine dynamometer cycled through steady-state and transient modes to simulate demands on the engine in city traffic. Test procedures were designed to optimize reproducibility of the tests. Moreover, analyses were scheduled in a manner to permit determination of all components on the same or on comparable samples. Carbon hydrocarbons by major types, oxygen, oxides of nitrogen, and hydrocarbon-derived oxygenates were determined. Concentrations that were measured fell within a range of values that had been reported in the literature. However, the analyses are unique in that they provide information on the simultaneous, concurrent concentrations of materials that constitute the exhaust gas flow and on how these concentrations vary with steady-state and transient engine operation. The data also show the manner in which both absolute and relative distributions of hydrocarbon in the exhausts vary with change in engine mode. (Author abstract modified)**

01604

R. P. Hangebrauck, D. P. Lauch, and J. E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS FROM AUTOMOBILES AND TRUCKS. Am. Ind. Hyg. Assoc. J., Vol. 27:47-56, Feb. 1966.

As part of a screening survey to determine the origin of the benzo(a)pyrene found in urban atmospheres in the United States, emission rates of several polynuclear hydrocarbons, including benzo(a)pyrene, were measured on several automobiles and trucks powered by gasoline engines. The vehicles were road-tested over typical driving routes. The total exhaust was sampled by passing it through a multi-plate condenser followed by large high efficiency filters. Operating and emission data are given. The combined effects of vehicle-model age and mileage on polynuclear emissions are discussed, as are the relationships between polynuclear hydrocarbon emissions and the emissions of other products of incomplete combustion. (Author abstract)**

01611

A. H. Rose, Jr., R. Smith, W. F. McMichael, and R. E. Kruse

COMPARISON OF AUTO EXHAUST EMISSIONS IN TWO MAJOR CITIES . J. Air Pollution Control Assoc. 15, (8) 362-6, Aug. 1965.

Direct measurement of emissions from vehicles operating under actual traffic conditions in Los Angeles, California, and Cincinnati, Ohio are presented. Exhaust emissions expressed as pounds of contaminant emitted per vehicle mile traveled are a function of average speed of the vehicles over the designated route (average route speed) regardless of the characteristics of the specific route and can be best shown as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed. Exhaust emissions expressed as concentration provide a less valid measurement of atmospheric contamination than emissions expressed as pounds per vehicle mile traveled. The reason is believed to be the variability in consumption of combustion air by vehicles and in characteristics of the test routes. The emission data expressed as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed show no significant differences between Los Angeles and Cincinnati. The effects of peak versus offpeak traffic on emissions expressed by weight are basically a function of the changes in average route speed. (Author summary modified)##

01651

H. Tye, R. J. Burton, E. Bingham, Z. Neil, and A. W. Horton

CARCINOGENS IN A CRACKED PETROLEUM RESIDUUM (THE CONTRIBUTIONS OF VARIOUS POLYCYCLIC AROMATIC HYDROCARBONS TO THE CARCINOGENIC POTENCY OF A CATALYTICALLY CRACKED OIL). Arch. Environ. Health, 11(2):202-207, Aug. 1966.

An extensive examination, which involved the preparation and bioassay of more than 100 fractions, of a petroleum residuum, RR, from commercial fluid catalytic cracking, was performed. The preparation of the fractions involved distillation at reduced pressures, solvent extraction, chemical reactions, and chromatography. The fractions were assayed for carcinogenic potency by repeated application to the skin of C3H mice. It was possible to categorize the carcinogens and to evaluate the contribution of each category to carcinogenic potency of the whole residuum. The major carcinogens in this oil were categorized according to whether they were found in the relatively high boiling portion (340-455C) characterized by the presence of 5-ringed or alkyl 6-ringed PAH, in intermediate fractions (300-340 C) characterized by unsubstituted and methyl substituted 6-ringed PAH, and in lower boiling fractions characterized by assorted smaller compounds including alkyl 5-ringed PAH. In the same order the percentages by weight (of the whole oil) of characteristic carcinogens found in each category were as follows: benzo(a)pyrene, 0.4%; benz(a)anthracene and alkyl homologs 0.4%; and benzo(c)phenanthrenes, 0.01%. Larger quantities of benzo(c)phenanthrenes may have been present in the intermediate fractions, which were not analyzed for these compounds. In spite of the small percentage that was found, the presence of this class of carcinogens may be significant because they were the dominant carcinogens in the most volatile portion of the oil. (Author summary modified)##

01662

S. T. Cuffe and R. W. Gerstle

EMISSIONS FROM COAL-FIRED POWER PLANTS: A COMPREHENSIVE SUMMARY. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (Presented at the American Industrial Hygiene Association Meeting, Houston, Tex., May 1965.) (PHS Publ. No. 999-AP-35.) 1967. 30 pp.

A series of tests on six coal-burning power plants has been conducted to determine certain stack gas components of interest in atmospheric pollution. The six units tested included three dry-bottom pulverized coal-burning units, two wet-bottom units, and a large spreader-stoker traveling-grate unit. Measurements of sulfur oxides indicate that essentially 90 to 100 percent of the sulfur in the coal appears as sulfur oxides in the stack gas. Of this amount 1 to 2 percent is in the form of sulfur trioxide and the balance is sulfur dioxide. Neither the type of furnace, the conditions of firing, nor the reinjection of fly ash affected sulfur oxide emissions significantly. Concentrations of sulfur oxides are thus essentially determined by the amount of sulfur in the coal entering the furnace. Concentrations of nitrogen oxides varied widely, ranging from 231 ppm for the vertically fired unit to 1204 ppm for the cyclone-type furnace. Concentrations of nitrogen oxides apparently are determined by: (1) initial flame temperatures in the firebox, (2) decomposition in the high-temperature region of the furnace, and (3) quenching of the decomposition reaction as the gases are cooled in the boiler section of the furnace. Control of particulate emissions varied considerably in coal-fired power plants. Combination cyclone and electrostatic-precipitator-type fly-ash collectors gave collection efficiencies of about 96 percent and an outlet grain loading of 0.20 grain/scf at full load. Electrostatic precipitators and mechanical cyclone collectors, when used separately, gave average collection efficiencies ranging from 75 to 85 percent, with loadings at the fly-ash collector outlet varying from 0.19 to 0.68 grain/scf. Additional emissions determined included polynuclear hydrocarbons, carbon monoxide, gaseous hydrocarbons, formaldehyde, and trace metals. None of these components was found in appreciable quantities during normal furnace operating conditions. (Author summary)**

01668

Ludwig, J. H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Technology Assessment and Development Program, Washington, D.C. ((5u))p., 1968. 1 ref.

The contribution of motor vehicle emissions to community-wide air pollution levels; emissions from gasoline and diesel engines; and photochemical reactions in the atmosphere are reviewed.**

01534

H. Wozniczek

AIR POLLUTION BY MOTOR CAR EXHAUST GASES) ZATRUCIE Powietrza Przez Spaliny Samochodowe. Ochrona Pracy (Warsaw), 21(5):14-17, May 1966.

Pollution of towns and cities by automotive emissions is described. Chemical analyses of the various constituents of exhaust gases are given. Toxicity of these constituents is discussed.##

01544

J.D. Kalasky

VENTILATION AND METHANE DRAINAGE IN LONGWALL MINING. MINING Engineering 18(8):79-82, Aug. 1966.

The facilities and procedures necessary for adequate ventilation and methane drainage in longwall mines are described. Schematic diagrams showing air coursing and air inspection stations are presented. Company standards require that methane concentration be kept below 0.50%.##

01545

J.J. Hanks H.D. Rube

INDUSTRY ACTION TO COMBAT POLLUTION. Harvard Bus. Rev., 44(5):49-62, Oct. 1966.

The responsibilities of individual corporations in air pollution abatement are emphasized. Sources of pollution discussed include the paper, steel, electric power, transportation and petroleum industries. Principal equipment for removal of aerosols and particulates is described. It is concluded that although air pollution equipment increases costs in certain industries, recovery of pollutant, such as fly ash, may help to offset the costs. Government activities in air pollution programs are summarized.##

01550

R. Bayer, R. Nandl, and J. Doubek

DEVICE FOR SAMPLING AND ANALYSIS OF METALLURGICAL FURNACE ATMOSPHERES. Zarizeni pro odber a analysu hutnich atmosfer. HUTNICKE LISTY (PRAGUE), 21(8) 532-538, AUG. 1966.

Two types of devices for sampling furnace atmospheres and an instrument for analyzing waste gases and furnace atmospheres based on gas chromatography are described. Specimens can be sampled and delivered to the analyser within seconds. Sampling from

several points can be carried out manually or automatically. Chromatographic analysis of O2, H2, CO, CO2 or CH4 can be performed within five minutes. The system can be adapted for other gases.##

01565

E. S. Starkman

ENGINE GENERATED AIR POLLUTION - A STUDY OF SOURCE AND SEVERITY. Preprint. (Presented at the Federal International Societes Ingeneures Techniques De L'Automobile, Germany, June 15, 1966.)

A brief comprehensive view of the state of knowledge, legislation, research and application of devices to control the influence of reciprocating engine emissions on man and his environment is presented from the viewpoint and experiences of a California observer. The pollutants considered are: unburned hydrocarbons; carbon monoxide; oxides of nitrogen; carcinogens; particulate matter; lead; odor; and oxides of sulfur. Engine operating modes and severity of emissions; engine factors and emissions; and legislative control of emissions are considered.##

01572

OXIDES OF NITROGEN IN THE ATMOSPHERE (CHAPTER V OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley. Bureau of Air Sanitation, p. 33-51, Jan. 1966.

This article discusses the air monitoring systems in California which detect the concentrations of nitrogen oxides. Concentrations are given for hourly, daily, monthly and seasonal variations. Statistics are also stated for hydrocarbon emissions but not in as much detail as for the oxides of nitrogen.##

01573

PHOTOCHEMICAL EFFECTS OF NITROGEN OXIDES (CHAPER VII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley. Bureau of Air Sanitation. p. 69-89, Jan. 1966.

The chemistry of the photochemical reaction is reviewed, with emphasis on the role of nitrogen oxides. It is concluded that quantitative predictions cannot be made about the changes in the photochemical smog effects that would result from various degrees of control of either hydrocarbons or nitrogen oxides from motor vehicles.##

01582

W.W. Gerstle D.A. Kennits

ATMOSPHERIC EMISSIONS FROM OPEN BURNING. J. Air Pollution Control Assoc. 17 (5), 324-7 (May 1967). (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-135.)

Open burning of municipal refuse, of landscape refuse, and of automobile components was simulated. Carbon monoxide emissions were: 85 pounds per ton of material burned when municipal refuse was burned, 65 pounds per ton when landscape refuse was burned, and 125 pounds per ton when auto components were burned. These values are all very high when compared to emissions from municipal incinerators or other combustion processes. Gaseous hydrocarbon emissions paralleled the carbon monoxide concentrations and averaged 30 pounds per ton of material burned for all tests. The organic acid concentrations were also fairly high, averaging about 15 pounds per ton of material originally present in all tests. Formaldehyde concentrations varied from 0.095 pound per ton for municipal refuse to as low as 0.006 pound per ton for the landscape refuse. These formaldehyde concentrations also exceed those normally found in incinerators. Emissions of nitrogen oxides varied widely and depended on the intensity of burning. Highest values occurred during the initial burning period when temperatures were high. After the initial intense burning period of about 10 minutes, the nitrogen oxides concentrations dropped off rapidly. Particulate emissions averaged 16 pounds per ton of material burned when municipal refuse was burned and 17 pounds per ton when landscape refuse was burned. Emissions jumped to 100 pounds per ton when auto components were burned. Emissions of polynuclear hydrocarbons were also quite high, but for municipal or landscape refuse they were comparable to emissions from small commercial incinerators. For auto components, the concentrations were very high, comparable to those found in emissions from small coal-burning furnaces. (Author summary modified)**

01615

AIR POLLUTION CONTROL IN CONNECTION WITH DDT PRODUCTION (INFORMATIVE REPT. NO 6). J. Air Pollution Control Assoc. 14, (3) 94-5, Mar. 1964. (TI-2 Chemical Industry Committee).

DDT (Dichlorodiphenyltrichloroethane) is made from chloral, monochlorobenzene and sulphuric acid. The air pollution aspects of the process and of storage are considered.**

01620

THE PETROLEUM REFINING INDUSTRY - AIR POLLUTION PROBLEMS AND CONTROL METHODS (INFORMATIVE REPT. NO. 1). J. Air Pollution Control Assoc. 14, (1) 30-3, Jan. 1964. (TI-1 Petroleum Committee).

Possible air-borne contaminants from refilling operations are covered. Control methods for gaseous and particulate emissions, and the industry's research projects are reviewed.##

01624

B.A. Jensen

SOURCES AND KINDS OF CONTAMINANTS FROM MOTOR VEHICLES (INFORMATIVE REPT. NO. 8). J. Air Pollution Control Assoc. 14, (8) 327-8, Aug. 1964. (TA-10 Vehicular Exhaust Committee).

The sources of the pollutants, the important compounds, and the magnitude of the several contaminant sources from both gasoline and diesel powered motor vehicles are indicated.##

01625

C. H. Easterfield

LITERATURE AND RESEARCH SURVEY TO DETERMINE NECESSITY AND FEASIBILITY OF AIR POLLUTION RESEARCH PROJECT ON COMBUSTION OF COMMERCIALLY AVAILABLE FUEL OILS. J. Air Pollution Control Assoc. 14, (6) 201-7, June 1964. (TA-9 Committee, Oil Burner Equipment.)

The basic purpose of this preliminary survey was to determine: (a) whether the combustion of fuel oil presented a serious air pollution problem by nature of its being a serious pollutant contributor; (b) what work has been done to evaluate its pollution contribution; (c) what work is being done; (d) what needs to be done; (e) if there is need and justification for a fuel oil combustion study.##

01654

A.C. Stern

THE REGULATION OF AIR POLLUTION FROM POWER PLANTS IN THE UNITED STATES. Rev. Gen. Roy. Belge Ingen. Ind., Brussels (Presented at the International Symposium on Inversion Regulations, sponsored by the Haus der Technik E.V. Essen and the Arbeits- und Sozialministerium (Dept. of Labor and Social Welfare) of North-Rhine-Westfalia, Essen, Germany Mar. 9, 1966; and before the Societe Royale Belge des Ingenieurs et des Industriels, Brussels, Belgium, Mar. 15, 1966.)

Author discusses the types, concentrations, and levels of control (state, federal and local) that the United States has initiated for the abatement of air pollution from power generating sources. Statistics are presented for various localities as well as specific pollutants which are emitted. The Clean Air Acts (88-206 and 89-272) as they apply to the abatement of air pollution are explained.##

01671

C.J. Conlon, P.A. Kenline, R.L. Cummins, V.J. Konopinski

MOTOR VEHICLE EXHAUST STUDIES AT THREE SELECTED SITES. Arch. Environ. Health 14, (3) 429-46, Mar. 1967.

Air quality was studied in relation to motor vehicle densities at three selected sites: the Sumner Tunnel between Boston and East Boston, Massachusetts; the International Peace Bridge across the upper Niagara River between Fort Erie, Ontario, and Buffalo, New York; and Laidlaw Avenue near the Air Pollution Research Facility in Cincinnati, Ohio. Pollutant concentrations and meteorological findings are presented for each site. Concentrations of pollutants known to be associated with auto exhaust were greater at sites of higher traffic density. A comparison of particulate pollution levels at the Sumner Tunnel operated as a one-way tube in 1963 with the tunnel carrying two-way traffic in 1961, indicates a definite decrease in pollutant levels. Other pollutants were assumed to be dispersed in air in the same way as carbon monoxide in determing the contribution by motor vehicles to ambient air for the Sumner Tunnel. Auto exhaust appears to be a prime contributor (greater than 50%) for carbon monoxide, aliphatic aldehydes, benzene-soluble particulate, and oxides of nitrogen. Lead, benzo(g,h,i)pyrene, and coronene may also be assumed to be important pollutants from auto exhaust, but they do not meet the requirements for contribution calculations. (Author abstract)##

01667

S.C. Rothman

ENGINEERING CONTROL OF INDUSTRIAL AIR POLLUTION: STATE OF THE ART, 1966. Heating, Piping, Air Conditioning Mar. 1966. 141-8 pp. (Presented before the First World Air Pollution Congress, Buenos Aires, Argentina, Nov. 1965.)

Problems encountered by the engineer are illustrated through analysis of air pollution control in the aluminum production industry. Prebaked pots and Soderburg pots and their fluoride emissions are considered.##

01746

J. A. Adams, and E. G. Hawkin

THE SUPPRESSION OF CARBON FORMATION IN PARTIAL-COMBUSTION GASIFIERS. Die Verhutung von Kohlenstoffausscheidungen in Gaserzeugern mit unterstochiometrischer Verbrennung. Erdol Kohle (Hasburn) 19, (8) 566-72, Aug. 1966. Text in Ger.

Wide industrial application of partial-combustion, liquid fuel gasifiers is limited by the occurrence of solid carbon in the resultant fuel gases. The theory of solid carbon formation and

its inhibition is discussed. Experiments are described in which carbon formation was suppressed in a partial-combustion distillate fuel gasifier by vaporizing the fuel in the presence of steam, carbon dioxide or nitrogen prior to combustion. In the presence of steam the amount of carbon formed is inversely proportional to the steam/fuel ratio at constant air/fuel ratio. (Author summary)**

01761

ORGANIC HALOGEN COMPOUNDS. (METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR.) Ministry of Labour, London, England (Booklet No. 12) 1966. 10 pp.

The booklet first describes industries and processes in which organic halogen fumes may be encountered, i.e. artificial silk, bleaching, dyeing and dye-making, dry cleaning, electroplating, engineering, lithography, refrigeration and rubber. It then describes the toxic effects, notably liver damage as a long-term effect and narcosis. The chief method of detection described is a halide detector lamp in which the halogen will react with a copper invert in the lamp to give a typical green copper color in the flame. It is emphasized that this is not a quantitative test although approximate limits of coloration for various organic halogen compounds are given; chlorobenzene, for example will show color at a minimum concentration of 35 ppm, while 1,2 dibromoethane will show color at 5 ppm. Approximately 50 compounds are thus classified.**

01788

R.P. Hangebrauck, D.J. Von Lehaden, J.E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS AND POLLUTANTS FROM HEAT-GENERATION AND INCINERATION PROCESSES. J. Air Pollution Control Assoc. 14, (7) 267-78, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11, 1963.)

This paper presents emission data from a series of tests, for which the sources tested included typical combustion processes involving the burning of conventional fuels (coal, oil, and gas) and of certain commercial and municipal solid wastes. In addition to obtaining over-all emission data from different sizes and types of combustion units, a primary objective of the study was to establish the relative importance of various combustion processes as contributors of benzo(a)pyrene (3,4 benzpyrene) and other polynuclear hydrocarbons with demonstrated or potential carcinogenic properties. The other pollutants measured included particulate matter, carbon monoxide, total gaseous hydrocarbons, oxides of nitrogen, oxides of sulfur, and formaldehyde. Two categories of combustion sources were tested. Those burning conventional fuels were designated as heat-generation processes, and those burning waste materials were classed as incineration processes. Design and operation data for the units studied are given in tables.**

01603

D. Hoffmann

A STUDY OF AIR POLLUTION CARCINOGENESIS. II. THE ISOLATION AND IDENTIFICATION OF POLYNUCLEAR AROMATIC HYDROCARBONS FROM GASOLINE ENGINE EXHAUST CONDENSATE. Cancer 15, 93-102, Feb. 1962.

1. Polynuclear aromatic hydrocarbons, both carcinogenic and noncarcinogenic in animal tests, have been identified in automobile exhaust "tar". These data do not indicate the nature or the amount of these substances in the air.
2. The results are based upon automobile exhaust obtained from a conventional engine under road load, a typical gasoline, and used under "city driving" conditions. Present evidence suggests that the mileage run by an engine does have an influence on the formation of polynuclear aromatic hydrocarbons.##

01615

A.P. Altshuller P.W. Leach

REACTIVITY OF AROMATIC HYDROCARBONS IN IRRADIATED AUTOMOBILE EXHAUST. Intern. J. Air Water Pollution 8, 37-42, 1964.

Gas chromatographic analyses for up to 14 aromatic hydrocarbons in the 7-10-carbon range and for ethylene and propylene were made in irradiated auto exhaust containing total hydrocarbons at 1-, 5- and 12-carbon ppm. The total and individual hydrocarbon concentrations corresponded to the range of atmospheric levels which have been measured in Los Angeles, and San Francisco. About 40 per cent of the m-xylene and p-xylene and of the 1,3-methyl-ethylbenzene and 1,4-methyl ethyl benzene reacted to form products. Over 70 per cent of the trimethylbenzenes reacted to form products. The average percentage conversion of the 7-1 carbon aromatic hydrocarbons measured was approximately the same as the percentage conversion for the ethylene plus propylene. These results provide confirmation at atmospheric concentration levels, of the reactivity of aromatic hydrocarbons. (Author abstract)##

01617

W. F. McMichael and A. H. Rose, Jr.

A COMPARISON OF AUTOMOTIVE EMISSIONS IN DENVER AT LOW AND HIGH ALTITUDES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-22.)

Automobile exhaust emissions were studied in Denver, Colorado. Denver is unique among large cities in the United States in that it is situated at an altitude of approximately 5,000 feet; the opportunity was thus provided for observing the effects of altitude on auto exhaust emissions. The emissions measured in Denver in

1961 are compared with the emissions obtained in a similar, previously reported study in Los Angeles, California, and Cincinnati, Ohio. The survey techniques and the instrumentation used to collect and analyze the exhaust samples were the same. Emission measurements were made on test vehicles driven under actual traffic conditions while equipped with a proportional sampler. This method produces data that reflect the effects of traffic density, route, climate, and altitude.##

01838

T. D. Havens and F. A. Rohrman

GASEOUS AND PARTICULATE EMISSIONS FROM SHALE OIL OPERATIONS. Preprint. (Presented at the American Chemical Society Meeting, Pittsburgh, Pa., 1966.)

World-wide and domestic demands for hydrocarbons tend to seek the most economical and convenient sources for potential exploitation. It has been said that the oil shale deposits of the world constitute many times the total of the world's reserves of liquid petroleum. The vast shale oil industry is nearly upon us as the problems of finding new economical sources of liquid petroleum are becoming more acute. The next 5 or 10 years could see the emergence of shale oil industry producing a million or more barrels a day in this small area of the Rocky Mountains. Any ripples of unfavorable prices on imported crude or finished products could cause abrupt waves of decision as to the time of arrival of this industry. It is hoped that all operations involving a future shale oil industry will take cognizance of the potential air pollution problem. To disregard air pollution at the early stages of development may require later intensive and extensive engineering at a much higher cost.##

01839

A. H. Rose

SUMMARY REPORT OF VEHICULAR EMISSIONS AND THEIR CONTROL. Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 1965.)

The report summarizes average emissions from the four sources of contaminants in the present day automobile: the exhaust, the crankcase, the fuel tank, and the carburetor. Levels of contaminants presented are for emissions under average urban driving conditions, in contrast to earlier work in which values were based on cyclic dynamometer tests. Emission levels are expressed as pounds per day emitted and, where applicable, as concentration. Emissions are considered by general chemical classes to indicate the relative photochemical reactivities of compounds from each of the four sources. Control approaches are briefly discussed. (Author abstract)##

01861

AUTOMOTIVE AIR POLLUTION; (SECOND REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (1st Session (Document 42) July 15, 1965. 17 pp.

Progress is reported on the resolution of the following problems: exhaust emissions, crankcase emission, fuel evaporative losses, maintenance, fuel, and diesels. The relevant literature is reviewed.##

01860

AUTOMOTIVE AIR POLLUTION. (THIRD REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (2nd Session) (Document 83) Mar. 25, 1966. 17 pp.

Reduced exhaust emissions of hydrocarbons and carbon monoxide have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fueled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase exhaust hydrocarbons and carbon monoxide, particularly following cold engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and carbon monoxide emitted in exhaust gases. A survey conducted to measure carbon monoxide levels in urban communities suggests that human exposure to carbon monoxide may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and carbon monoxide, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution and its control is indicated by the recent activities of technical associations. (Author summary)##

01805

W. T. McKean, Jr.; R. P. Hruttfiord, and R. V. Gerhansen

KINETIC ANALYSIS OF ODOR FORMATION IN THE KRAFT PULPING PROCESS I. Paper Trade J. 149, (35) 41-2, Aug. 30, 1965

and Tappi 48, (12) 699-704, Dec. 1965. (Presented at the National Meeting, American Inst. of Chemical Engineers, San Francisco, Calif., May 1965.)

The kinetics of the consecutive formation of methyl mercaptan and dimethyl sulfide at constant liquor composition were determined at several temperatures using a novel gas analysis based on vapor phase sampling. Comparison of kraft pulping of softwood and hardwood species shows that more organic sulfur compounds are produced from the latter group. In softwood pulping, a general enhancement in the reactivity of the lignin methoxyls occurs during the alkaline delignification process which results in accelerated odor formation during the last phase of pulping. The activation energies of these reactions suggest a substantial reduction in total formation of organic sulfur compounds may be accomplished by raising the reaction temperature and shortening the time of the kraft cook. The significance of the results to actual kraft pulping process is discussed. (Author abstract)##

01890

Williams, J. D., G. Ozolins, J. W. Sadler, and J. R. Farmer

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. VIII. A PROPOSAL FOR AN AIR RESOURCE MANAGEMENT PROGRAM. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 132p., May 1967. 7 refs

This report is devoted to the development of an air use plan for the St. Louis metropolitan area. An air use plan may be thought of as a link between the potential pollutant emissions of a community and the air quality goals. Its function is to optimize the use of the air with respect to the amount of pollutants emitted, by considering the dilution capacity of the air basin and the configuration of the pollutant sources in the area. The air use plan may then be used as the basic framework for achieving the desired air quality by the various means available such as limiting the emissions from individual sources, limiting the emissions from sources in certain areas, or even disallowing new pollution sources in overburdened areas. In short, it provides the basis for enacting control regulations and provides a guide for future planning activities.##

01894

P. A. Bennett, R. M. Jackson, C. F. Murphy, and R. A. Randall

CRANKCASE GAS CAUSES 40% OF AUTO AIR POLLUTION. SAE (Soc. Automot. Engrs.) J. 68, 31-6, Mar. 1960.

Crankcase gas is a major contributor to air pollution. In fact, tests show that hydrocarbon emission from the crankcase is of the same order of magnitude as that due to exhaust. Composition of exhaust and crankcase vent or blowby gases of five test cars was determined by: Orsat analyses (carbon dioxide, oxygen, and carbon

monoxide) of grab samples obtained before and after a combustion train; and a Beckman I/R Model 15A infrared analyzer, which continuously measured exhaust and crankcase vent or blowby concentrations. It was equipped with an n-hexane detector and quartz optics. By using gas chromatography, measured Beckman concentrations were converted to absolute hydrocarbon concentrations. Blowby gases were shown to be predominantly carbureted mixture. This led to the conclusion that the specific hydrocarbons in the fuel determine the specific hydrocarbons in the crankcase gases. Therefore, in cars whose crankcase emissions are not controlled, the fuel used will determine the crankcase hydrocarbons emitted. Feeding engine crankcase gases back to the intake system eliminates crankcase hydrocarbon emissions without appreciably affecting exhaust emissions. An internal crankcase ventilating system can thus eliminate approximately 40% of the engine hydrocarbon emissions (considering crankcase plus exhaust, under all operating conditions) exclusive of carburetor vent losses.**

01902

R. Mukai, J. F. Thomas, and R. D. Tebbens.

AROMATIC HYDROCARBONS PRODUCED DURING COMBUSTION OF SIMPLE ALIPHATIC FUELS. Anal. Chem. 37, 398-401, Mar. 1965. (Presented before the Division of Water, Air and Waste Chemistry, 148th Meeting, American Chemical Society, Chicago, Ill., Sept. 1964.)

The combustion of simple aliphatic fuels such as methane and propane at atmospheric pressure results in the formation of a wide array of products. Previous work has been concerned with arene-type products. Current work has shown the relative production of benzene, toluene, ethylbenzene, as well as other simple alkyl substituted derivatives of benzene. The practical aspects include an index of relative abundance of the latter type of compounds that might be found in polluted atmospheres as well as indicating a method for predicting the relative contribution of automobile exhaust to atmospheric pollution. (Author abstract)**

01941

R. B. Jacobs

HEALTH ASPECTS OF AIR POLLUTION FROM INCINERATORS. Proc. Natl. Incinerator Conf., New York, 1966. pp. 126-31.

The public health aspects of incinerator exhaust gases are discussed first in the light of the physiological response induced by specific contaminants such as sulfur oxides, nitrogen oxides, and other inorganic gases and aldehydes, organic acids, esters, polynuclear hydrocarbons, and other organic compounds; second, with respect to their relation to illness caused by air pollution in general such as emphysema and other respiratory diseases, allergenic responses, and cancer; and third on the character of the effluent gases, namely domestic, municipal, or industrial. One aspect of domestic incinerator effluents is

particularly stressed; that is, the effect on nearby residents. The contribution that incinerator exhaust gases make to the air pollution of any given community depends on the ratio of the amount of refuse and garbage burned to the total amount of fuel used and consumed in that region.**

01958

F. W. Leach, L. J. Lang, T. A. Bellar, J. E. Sigsby, Jr., and A. P. Altshuller

EFFECTS OF HC/NOX RATIO ON IRRADIATED AUTO EXHAUST, PART II. J. Air Pollution Control Assoc. 18, (5) 176-81, May 1968. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11-13, 1963.)

The relative concentrations of individual hydrocarbons have been shown to be independent of autoexhaust concentration in dynamic irradiation experiments. The absolute concentrations of the individual hydrocarbons are linearly related to total hydrocarbon concentration. The decrease in the concentration of reactive hydrocarbons during irradiation is found to be independent of whether a 120- or a 180-minute average irradiation time is used. A fourfold reduction in initial hydrocarbon concentration at constant hydrocarbon to nitrogen oxide level causes a slight increase in the relative amounts (percent) of hydrocarbon consumed during irradiation. The same fourfold reduction in initial hydrocarbon concentration at constant nitric oxide level results in a decrease in the percent of olefins reacted, but does not affect the percent of aromatics reacted. If the hydrocarbon level is kept constant, while the nitrogen oxide level is varied, an increase in nitrogen oxides causes a marked reduction in the percent of olefinic and aromatic hydrocarbons reacted during irradiation. The aldehyde yields are linearly related to the total hydrocarbon level. No significant effect on aldehyde yields was found when the average irradiation time was varied from 120 to 180 minutes. The aldehyde yields did vary with a decrease in yield both at very high and very low ratios of hydrocarbon to nitrogen oxide. The individual hydrocarbon and aldehyde concentrations are shown to fall well within the range of atmospheric concentrations. Although the aldehydes may be responsible in part for the eye irritation, the presence of other eye-irritating species must be postulated to explain the shape of the eye-irritation response curves when plotted against nitrogen oxide concentration.**

02001

B. Gill E.I. Howe

OIL BURNERS FOR DOMESTIC APPLICATION: PRESENT DESIGN AND FUTURE DEVELOPMENTS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/2.) pp. 37-44.

Published work from various research organizations in Europe and the U.S.A. concerning malfunctioning of domestic pressure jet burners is reviewed. It is shown that when poor combustion

performance of pressure jet burners is experienced the cause can be traced to one, or a combination of the following factors: 1. Poor design of the air/fuel mixing system. 2. Bad maintenance. 3. Bad matching of the burner characteristics to the heating appliance requirements. Bad performance of any combustion system is reflected in the composition of the final exhaust products. Results are presented which show that a combustion system can generally be operated so that it products no smoke, carbon monoxide or unburnt hydrocarbons. Due to attention which has recently been drawn to "exhaust odor" from oil-fired appliances reference is made to methods of measuring the total hydrocarbon content of flue gases. Recent developments with the objective of impo developments with the objective of improving the combustion performance and reliability of domestic oil burners are described, together with references to research into methods of distillate fuel atomization and combustion using novel principles. (Author abstract modified)##

02017

R.A. Terseulen

AIR POLLUTION CONTROL BY OIL REFINERIES. Proc. (Part I) Intern. Clean Air Cong., London, 1966 (Paper IV/5). pp. 93-5.

Stichting CONCAWE has been established by the Oil Companies' International Study Group for Clean Air and Water Conservation (Western Europe). Its Working Group on Atmospheric Dispersion is active in the field of abatement and control of air pollution originating from both domestic and industrial complexes. Major air-borne contaminations, from oil refining operation but not petrochemical operations, such a hydrocarbons, mercaptans, carbon monoxide, hydrogen sulphide and sulphur oxides other than from refinery flue gas, are discussed. Most common sources of the above contaminants are discussed, together with the general refinery practices for preventing or reducing emission of these contaminants. The effectiveness of modern refinery processes in reducing air pollution is reviewed and examples of local conditions and the way they affect the setting of practical limits of emissions are discussed. In conclusion, the general oil industries views with respect to the air pollution problem are summarized. (Author abstract modified)##

02021

G.J. Cleary

POLYCYCLIC HYDROCARBON RATIOS: THEIR USE IN STUDYING THE SEQUENCE OF COMBUSTION IN A HAND-FIRED INTERMITTENT BRICK KILN. Proc. (Part I) Intern. Clean Air Cong., London, 1966, Paper IV/11). pp. 111-4.

Concentration ratios of polycyclic aromatic hydrocarbons have been used to study combustion inn a hand-fired intermittent brick

kiln. Soot samples were obtained at various stages in the heating cycle using a scroll-type high efficiency cyclone located at the base of the stack. There is a gradation in the nature of the tar adsorbed by the soot, that collected early in the drying stage being primary, as the temperature rises there is a transition to secondary tar. The highest concentration of polycyclic aromatic hydrocarbons coincides with the highest soot fall from the kiln. Two possible mechanisms are examined. In both it is assumed that soot with absorbed primary tar is deposited on kiln walls and product surfaces during the steaming period and that towards the end of the preheating period the higher flue gas velocities and greater temperature gradients dislodge the soot: (a) in the early part of the steaming period, as successive layers of soot deposit they prevent volatilization of the tar adsorbed on previous deposits. When the soot is dislodged the adsorbed tar, no longer shielded, is thermally cracked on the surface of the carbon particles: (b) the primary tar is alternatively cracked on the surface of the soot before the latter is dislodged and this assumes that the adsorptive forces are sufficiently strong to prevent the mass transfer of the adsorbed tar into the flue gas stream. (Author abstract)##

02066

W. Breuer, and F. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft und Ausbreitung von Luftverunreinigungen, Ermittelt Durch stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components (CO, CO2, SO2, H2S, Cl2, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

02152

G. Weston.

EXCESSIVE EMISSIONS OF FIREDAMP IN THE WEST LANCASHIRE AND NORTH WALES COALFIELDS. MINING ENGR. (LONDON) 126, (78) 81-96, Nov. 1966.

Several recent sudden emissions of firedamp in the Lancashire and North Wales coalfields are reported; steps taken to deal with the emissions and recognition of common factors indicating when similar occurrences might be expected are recorded and analysed. Firedamp

drainage by boring holes into the seams close below the one being worked was one method employed. The system should be capable of dealing with more firedamp than is normally encountered to protect against sudden substantial emissions. Regular monitoring of firedamp emitted from wastes and in the tunnels is necessary. Emissions of firedamp from the seam being worked may be reduced if steps are taken to "harden" the coal.##

02151

C. A. Pegun.

CONTROL OF AIR POLLUTION AND WASTE HEAT RECOVERY FROM INCINERATION. PUBLIC WORKS 97, (6) 100-3, JUNE 1966.

Europe has had for some time rigid government standards controlling air pollution with many large scale air pollution control installations, particularly of refuse incineration facilities. The nature of air pollutants from refuse incineration is discussed. The chemical analysis of fly ash is given as well as the size distribution of stack dust emissions. Air pollution abatement equipment is described. The approximate characteristics and costs of major collector systems are tabulated.##

02232

R.I. Steinburg, T.P. Hangebrauck, D.J. Von Lhamden, A.H. Rose, Jr.

EFFECTS OF HIGH VOLATILE FUEL ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 11, 376-83, Aug. 1961 (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

A readily vaporizable solid fuel normally considered as being more difficult to burn than ordinary cellulose was treated in a multiple chamber incinerator having an 8.5 sq. ft. grate area in a 19.5 cu. ft. primary combustion chamber, a downpass mixing chamber and a 16.5 cu ft. final combustion chamber. One part shredded asphalt saturated felt roofing composed of 60% petroleum base asphalt, 37 1/2% felt, and 2 1/2% ash with one part 4" squares of newspaper was the fuel mixture. The effects of combinations of excess air (100 and 200%), fuel feed rate (100 and 150 lb/hr), fuel per charge, underfire air (15 and 60%), and secondary air on the emission of particulates, oxides of nitrogen, hydrocarbons, carbon monoxide, formaldehyde, and smoke were evaluated. Optimum conditions imply a temperature range of 1800 to 2000 F in the secondary chamber, 15 to 20% underfire air, and small batch or continuous charging.##

02239

CHEMICAL INDUSTRY REPORT (REVISED INFORMATIVE REPORT NO. 1). J. Air Pollution Control Assoc. (FI-2 Chemical Committee), 13, (10) 496-9, Oct. 1963.

The chemical industry uses raw materials from mine, forest, sea, air, and farm; from oil, brine and gas wells; and from by-product materials of many other industries. It converts these widely diversified raw materials into more than 8,850 compounds, called "end chemicals," in more than 12,000 plants operated by hundreds of chemical manufacturers. Since World War II the chemical industry has become so diversified that it is difficult even to classify it accurately. Today, petroleum producers are now important chemical manufacturers; paper companies, rubber companies, even manufacturers of electrical machinery and farm equipment are chemical producers. This report will discuss in general terms some of the characteristics of emissions from certain kinds of operations and the relation of the plant operators to the Air Pollution Control officials.##

02235

HYDROCHLORIC ACID MANUFACTURE, REPORT NO. 3. J. Air Pollution Control Assoc. 13, (10) 502-5,7, oct. 1963.(TI-2 Chemical Committee.)

This report, published as Informative Rpt. No. 3 of the Air Pollution Control Association's TI-2 Chemical Committee represents the "best thinking of the Association" on the subject. The manufacture of hydrochloric acid involves the generation of hydrogen chlorid gas and its absorption in water for the aqueous solutions. There are three principal processes used to produce hydrogen chlorides: (1) Reaction of salt and H2SO4 (Mahnheim Process) resulting in the production of hydrogen chloride gas and sodium sulfate; (2) Burning chlorine in a slight excess of hydrogen; (3) As a by-product from chlorination of organic compounds. Up until the early thirties more acid was made by the salt-acid process; by 1961 the hydrogen-chlorine process was more in use. Air pollution aspects of the processes are reviewed.##

02244

A.H. Rose, Jr.; R.C. Stahman; R.V. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST, PART I. J. Air Pollution Control Assoc. 12, 468-73, Oct. 1962. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The data from this series of tests run under dynamic irradiation conditions show differences attributable to: (1) the concentration of exhaust gas at which the irradiation was made, and (2) the composition of the fuel used to produce the exhaust gas. Evaluations of the variations in chemical reaction and biological effects show: (1) The rate of NO2 formation increased proportionately with both exhaust concentration and olefin content of the fuel. (2) The percentage of NO2 reacting with unreacted fresh exhaust components and with secondary reaction products varied inversely with the increase of the exhaust concentration level. (3) No consistent change in oxidant concentration level (primarily ozone) resulted from an increase in the hydrocarbon concentration level at which the irradiation

was made. (4) Formaldehyde formation increased in direct proportion to the increase in hydrocarbon concentration at irradiation. (5) Plant effects indicate a shift in the type of phytotoxicant developed and a decrease in damage level with increase in the hydrocarbon concentration level at which the irradiation was made. (6) Bacterial effect showed a significant increase in degree of kill with increase in hydrocarbon concentration level at which the irradiation was made. (Author summary)**

02135

H. E. Newhall.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CHEMICAL KINETICS DURING RAPID EXPANSIONS OF HIGH TEMPERATURE COMBUSTION PRODUCTS (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in Engineering, California Univ., Berkeley, Graduate Div.) Sept. 1966. 198 pp.

Theoretical analysis predicts that during expansion of combustion products occurring in internal combustion engines, the rate of atom and free radical recombination is sufficient for equilibration of these species. It is further predicted that as a result of kinetic limitations, nitric oxide persists in hyper-equilibrium concentrations. Theoretical analysis of the kinetics of the expansion process was performed through use of a digital computer. Overall reactions considered were the decomposition of nitric oxide and the recombination of atomic oxygen, atomic hydrogen and the hydroxyl free radical. Rate expressions for the overall reactions were formulated through consideration of all significant elementary reactions. Reaction rate data for the elementary reactions were obtained from a large number of published sources. Nitric oxide is of considerable importance in the problem of automotive air pollution and an experimental study of nitric oxide decomposition occurring during engine cycle expansion was undertaken. A single cylinder research engine was equipped with an infrared transmitting window. The emergent infrared radiation was studied by means of spectroscopic equipment making possible the determination of nitric oxide concentrations throughout expansion. The results indicate that nitric oxide concentration remains fixed throughout the entire expansion process. (Author summary modified)**

02162

J.H. Ludwig

STATUS OF VEHICLE EMISSIONS IN AIR POLLUTION. Preprint. (Presented at the Eighth Annual Environmental Health Inst., Colorado Association of Sanitarians, Denver, Apr. 28, 1963.)

Review of the various classes of motor vehicles in use today and associated power plants indicates that as a group the gasoline-powered passenger car accounts for the major share of auto exhaust emissions associated with production of photochemical smog. Of the various sources of emissions from

all types of vehicles, tailpipe emissions from gasoline-powered vehicles are the most significant, followed by crankcase

02175

J. E. Digaby, Jr. and H. W. Korth.

COMPOSITION OF BLOWBY EMISSIONS. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-72.)

The composition of blowby emissions was evaluated from ten different cars with displacements ranging from 52 cu in. to 365 chromatographic analyses were made of the blowby hydrocarbon composition covering a group of approximately 75 components. Nondispersive infrared and Flame ionization equipment were also used to determine CO, CO2 and hydrocarbon concentrations. (Author abstract)##

02428

H. P. Sweeney

THE POTENTIAL OF MODIFICATIONS TO THE ENGINE INDUCTION SYSTEM ON PERFORMANCE AND EMISSIONS. Scott Research Labs., San Bernardino, Calif. 31 pp., 1966

This paper describes approaches to combining reduction in exhaust emissions from spark ignition internal combustion engines with equal improved "performance". In view of the new legislation of vehicle emissions, a new criterion of engine design is being added, so that now the basic criteria are: Power capabilities, economy, driveability and emissions. The induction system modifications discussed in this study are believed to play a large and increasing part in exhaust emission reduction. Furthermore author states that these improvements will contribute to improved general operation and performance of spark ignition internal combustion engines in the very near future.##

02527

D. G. Smith and E. S. Starkman

PERFORMANCE OF ANHYDROUS AMMONIA AS A SPARK IGNITION ENGINE FUEL. California Univ., Berkeley, Dept. of Mechanical Engineering. 62 pp., Feb. 1966.
CFSTI, DDC: AD 631632

The operating characteristics of anhydrous NH3 as a fuel for a spark ignition engine were determined and compared, experimentally and theoretically, to those of iso-octane, the reference hydrocarbon fuel. Experimental data obtained over a wide range of parameters--compression ratio, engine speed, manifold pressure--displayed no grossly divergent fuel characteristics for NH3 compared to iso-octane. Anhydrous NH3 was demonstrated to operate successfully as a fuel for spark ignition engines.

Principal requirements are that it be introduced into the engine in the vapor phase and be partly dissociated to H_2 and NH_3. Dissociation was accomplished in a temperature controlled catalytic dissociator using pelletized activated iron catalyst. The optimal weight concentration of H_2 to insure against power loss is approximately 5%. The maximum theoretically possible indicated output using ammonia vapor when adjusted for 5% hydrogen dissociation is about 75% of that with hydrocarbon. The presently obtained maximum experimental level is 72% at a compression ratio of 10. Specific fuel consumption, both by theory and experiment, is twofold at maximum power and 2-1/2 fold at maximum economy when using ammonia as a replacement for hydrocarbon. Spark timing for maximum performance must be advanced slightly for ammonia but sensitivity to spark timing is very little greater than with hydrocarbons. (Author summary modified)**

02548

F. I. Dubrovskaya, I. A. Pinigina, and V. N. Styazhkin

POLLUTION OF AIR BY SYNTHETIC FATTY ALCOHOLS AROUND A FACTORY PRODUCING FAT SUBSTITUTES. (Zagryaznenie atmosfernogo vozdukha sinteticheskimi zhirnymi spirtami vokrug proizvodstva zhirozamenitelei.) Hyg. Sanit. 31, (1) 113-5, Jan. 1966.
CFSTI: TT66-51160/1-3

The qualitative and quantitative composition of alcohols contaminating the air around factories producing synthetic fatty alcohols and synthetic fatty acids, is described for the first time. Such air may contain volatile lower alcohols, as well as less volatile higher alcohols. Since aliphatic alcohols differ in their toxic properties, the maximum permissible atmospheric concentration should be established for each alcohol separately.**

02549

I. V. Buzunova, A. M. Bukov, A. M. Gurevich, and E. P. Nikitinskaya

SLAG HEAPS AS A SOURCE OF ATMOSPHERIC POLLUTION. (Otvaly ugol'nykh shakht kak istochnik zagryazneniya atmosfernogo vozdukha.) Hyg. Sanit. 330 (1) 118-20, Jan. 1966.
CFSTI: TT66-51160/1-3

The burning slag heaps of the coal mining districts in the Rostov Region, where the principle combustible component is anthracite, do not present any carcinogenic hazard. However, this conclusion cannot be extended to burning rocks in slag heaps containing quantities of other grades of coal, such as bituminous coal, and particularly coal which processes a higher content of tarry substances. The burning slag heaps give rise to considerable pollution of the atmosphere by carbon monoxide and sulfur dioxide.**

02571

N.V.A. Zanycheva, L.G. Andrienko, N.V. Orienko, I.S. Kiseeva

THE CARCINOGENIC PROPERTIES OF COKE OVEN WASTES. (O kantserogennykh svoistvakh vybrosov koksovykh pechei.) Hyg. Sanit. 29, (5) 6-11, May 1964.
CFSTI: TT65-50023/5

The authors present data on the concentration of 3,4-benzpyrene, anthracene, 1,2-benzanthracene, phenatrene, pyrene, chrysene in the discharges of coke oven into the air and the effect exerted by these discharges on animals in a biological test. It was shown that the coke gas resin in the coke oven discharges contains 0.3% of benzpyrene and certain other polycyclic aromatic carbonhydrates and has a strongly marked blastogenic effect on experimental animals. As a means of control of atmospheric air pollution with cancerigenic substances the authors suggest a smokeless method of charging coke ovens. (Author abstract)##

02610

C. V. Kanter, and R. G. Lunche

EMISSIONS AND POLLUTANT LEVELS (TRENDS IN LOS ANGELES). Arch. Environ. Health 8, (1) 5-10, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

For accurate assessment of the problems, needs, and progress of an air pollution control program, accurate information must be obtained on emissions of contaminants from sources, and on contaminant levels. This is a very large task, requiring the acquisition of a great mass of data on a continuing basis. In a large community suffering the blight of smog, the acquisition of data is imperative in order to take effective action to stop the advancing menace and to begin a trend back toward clean air. In Los Angeles total air pollution surveys and air monitoring activities have provided the means for understanding the basic causes of the smog problem, and for guiding actions which have slowed the advance of smog and which will turn it back. Inspection of trends of emissions and contaminant levels in Los Angeles County affirms that a vigorous control program on stationary sources can slow and even reverse trends. It is clear though, that permanence of these effects cannot be achieved until the increasing emissions from motor vehicles are controlled. Of the major contaminants discussed, only sulfur dioxide, which is not significantly affected by motor vehicles emissions, has regressed.##

02635

J. H. Boddy and D. Turner

A DEFINITION OF THE PROBLEM AND SIGNIFICANCE OF AIR POLLUTION FROM PETROL-ENGINED VEHICLES (PART I OF ATMOSPHERIC POLLUTION: A

SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 1-38.

World-wide legislation is reviewed; the existing and probable restriction on vehicle use and design is presented. The motor vehicle pollutants are detailed. The public health significance is examined. Automotive emissions are compared to those from other sources. Existing legislation in the western and non-Communist world, other than the Californian legislation, imposes negligible restrictions on the gasoline engine at present, but shows indications of imminent action. Legislation in many countries is framed in such a way that regulations against emission from gasoline vehicles could be enforced without major revision of legislation. This is most apparent in recent revisions of legislation, e.g. Ireland, France, and Belgium. When and if the present legislation in the U.K. is successful in controlling pollution from industrial and domestic sources, more attention must inevitably focus on the motor vehicle. The gasoline-engined vehicle makes a major contribution to the following pollutants: carbon monoxide, unburnt hydrocarbons, and oxides of nitrogen. Of these pollutants referred to, carbon monoxide is certainly the most undesirable. Oxides of nitrogen may be more damaging in respect to chronic exposure but evidence is limited. Unburnt hydrocarbons in vapour form appear significant only in relation to photochemical smogs. Heavy hydrocarbons in association with non-particulate matter, like oxides of nitrogen, have possible significance in relation to effects of chronic exposure. The use of lead in gasolines appears to have minor significance as a health hazard in respect to its pollution of the atmosphere. Major attention should be immediately devoted to the reduction of carbon monoxide emission from automotive vehicles. In the interests of clarifying the situation and, as a safeguard against possible legislation of an unnecessarily restrictive nature, the motor and petroleum industries should support research into the significance of such emissions as oxides of nitrogen and heavy hydrocarbons and methods of reducing these.##

02636

J. A. Walker

INFLUENCE OF GASOLINE COMPOSITION ON THE CONSTITUTION OF ENGINE EXHAUST (PART II OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. 35-64 pp.

The major component, adverse to health, in gasoline engine exhausts is carbon monoxide. Fuel composition has no influence on the production of this toxic compound and it is recommended therefore that work is carried out to develop other practicable methods of minimising CO in engines of European design. Traces of unburned hydrocarbons are also present in exhaust gases and in California they contribute to smog formation by participating in photochemical reactions promoted by sunlight. This reaction rarely occurs in Europe, and thus hydrocarbons are of importance only because they may make a small contribution to

the presence of carcinogenic compounds in the air. The ARA has stated that in some 1966 model cars, an engine afterburner system will be fitted as original equipment which will convert CO and hydrocarbons to the harmless compounds CO2 and water. Any method adopted in Europe for removing CO from exhaust gases is likely to be of a similar type and inevitably the major part of the hydrocarbons present in the exhaust will also be converted into innocuous materials. It is recommended that work is carried out to assess the importance of the presence of oxides of nitrogen in the air, and if necessary to develop means of preventing their emission from gasoline engine exhausts. Particulate matter is emitted from engine exhausts consisting of sulphur compounds, carbon, compounds of lead and other materials. At the present it is not considered that these represent any appreciable health hazards, but it is recommended that close touch is maintained with workers in the U.S.A. and in the U.K. who are measuring the concentration and nature of particulate matter in the air, particularly under high traffic density conditions. Evaporation of gasoline vapours from the car fuel tanks and carburetors will probably be controlled in the U.S.A. The contribution to atmospheric pollution from these sources must be extremely small, but it is recommended that some work is carried out in European engines to investigate the factors involved. (Author summary)##

02606

F. J. Schuette

AUTOMOTIVE EXHAUST STUDY CONDUCTED AT U.S. BUREAU OF MINES PETROLEUM RESEARCH CENTER, BARTLESVILLE, OKLAHOMA (FINAL REPT. JULY 17-NOV. 10, 1959). California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab. (Rept. No. AIHL-1) June 9, 1960. 28 pp.

Based on the data included in this report it may be said that exhaust hydrocarbon analyses by n-hexane-sensitised non-dispersive infrared analysers are reproducible from one instrument to another when instrument variables are kept constant. For this reason, they make valuable survey instruments. It must be borne in mind that n-hexane sensitised analysers "see" only a fraction of the total exhaust hydrocarbons, the fraction depending on the instrument characteristics and the composition of the exhaust gas. Analysers sensitised to acetylene, benzene and ethylene used in this study were not reliable. Efforts to obtain two analysers with comparable responses did not produce satisfactory results. Preliminary investigations into flame ionization detection for exhaust hydrocarbon analyses indicate this instrument to be promising as a true carbon counter. Gas-liquid partition chromatography, although very time consuming, still appears to be the best method for analysis of exhaust hydrocarbons. Of course, there is still need for further refinement of techniques in this method. (Author conclusion)##

02911

R. L. Chass, R. G. Holmes, A. P. Fudurich, and R. R. Burlin

EMISSIONS FROM UNDERGROUND GASOLINE STORAGE TANKS. J. Air Pollution Control Assoc. 13, (11) 526-30, Nov. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-46.)

A test program was designed and carried out in two phases: a study of current service station filling losses, and determination of variations in these losses using a prototype vapor return system. Emissions from the filling of underground tanks amount to 11.5 lb of vapor for each 1000 gal of gasoline delivered; in Los Angeles County, this totals 38 tons per day, assuming splashloading techniques are used at all locations. Equipment auxiliary to the delivery and loading of this gasoline is responsible for an additional controllable total of five tons per day of vapor emissions. Use of various combinations of equipment and techniques could provide vapor control of the following magnitudes: A 17% reduction merely by converting from splash filling to submerged filling techniques. A 91% reduction by returning the vapors to the tank truck, but retaining the normal vent line from the underground tank to the atmosphere. Essentially complete reduction by using submerged filling, returning the vapors to the tank truck, and eliminating the atmospheric vent line. (Author summary modified) **

02956

G. B. Warren

FUEL-ECONOMY GAINS FROM HEATED LEAN AIR-FUEL MIXTURES IN MOTORCAR OPERATION. Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 7-11, 1965, Paper No. 65-WA/APC-2.)

Following suggestions resulting from previously published results a 1963 225 cu in., 8.2 to 1 compression ratio six cylinder sedan with automatic transmission was modified to permit cruising-speed operation with 10 to 25% leaned mixtures, the leaning air being separately heated by an exhaust heat exchanger. The heated leaning air was introduced into the intake manifold through fixed-area orifices below the throttle valve. With this arrangement, of course, opening of the main throttle valve by depressing the accelerator would drop the vacuum in the intake manifold and reduce or eliminate entirely the induction of leaning air and return the motor to full throttle, cold inlet, and normal throttle mixture immediately, and so result in no diminution of full-throttle performance. Slightly less than 10% gain in normal fuel consumption was demonstrated on a new and already very economical motorcar; analysis indicates that up to 15% may be obtainable. With the heated leaning air inlet no surging difficulties were encountered except at very low idling speeds, which it is believed could be obviated by refinements in controls or adjustments. Also, the smog-making properties of the exhaust should be reduced by this system. This is not to be confused with the more normal preheating of the air to the carburetor, which will also result in simultaneously enriching the fuel-air ratio, and will also reduce full-power performance. (Author abstract) **

03111

R.W. Gerstle, S.T. Cuffe, A.A. Orning, C.H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS, REPORT NO. 2. J. Air Pollution Control Assoc. 15, (2) 59-64, Feb. 1965

The Public Health Service and the Bureau of Mines are conducting a joint study to evaluate a number of flue-gas-stream components from coal-burning power plants. Emissions of fly ash, sulfur oxides, nitrogen oxides, polynuclear hydrocarbons, total gaseous hydrocarbons, formaldehydes, certain metals, and carbon dioxide are determined. A previous paper covered air pollutant emissions from vertical-fired and front-wall-fired power plant boilers. This paper includes a comparative evaluation of emissions from a tangential-fired and a turbo-fired power plant boiler. (Author abstract)##

03122

R. Brunner, P. Lemaigre

METHODS OF REDUCING POLLUTION CAUSED BY INTERNAL COMBUSTION ENGINES. (Motor Vehicles). European Conf. on Air Pollution Strasbourg, 1964. p. 191-258.

As a result of the growth of industry and the subsequent development of motor vehicles, European countries are faced with an air pollution problem the nature and size of which depend not only on the degree of industrialisation and the number of motor vehicles in use but also on the density of population and industry, traffic conditions and geographical and climatic conditions. The problem of pollution from motor vehicles in Iceland or Norway is different from that in Germany. The problem in France as a whole is not the same as the problem in Paris. The problem in Paris is, in turn, different from the smog problem in London, while the latter problem is different again from the smog problem in Los Angeles. In Belgium, Iceland, Norway, the Netherlands, Sweden, Switzerland and even Italy, the interest of the public, the police and legislature is concentrated mainly on the visible smoke from diesel vehicles, while petrol-driven vehicles are not yet regarded as a very serious source of pollution. In Switzerland, the inspection authorities have been primarily concerned from the outset (apart from gas emissions by factories) with the quantities of CO and lead compounds to be found in the air along traffic routes. This work began in the years immediately following the appearance of ethyl motor spirit on the market (1947). In the United Kingdom, attention also seems to be directed mainly towards other sources of pollution. In the Federal Republic of Germany and France mortality and morbidity statistics, reports on pollution trends in particular areas, the effects of pollution on people, plants and masonry have made doctors and learned societies alive to the changes, led to Press campaigns and impressed public opinion and government departments. The issue is not only the nuisance

caused by smoke, but, above all, the poisonous nature of the exhaust gases of petrol engines. Considered are: (1) - the organisation of anti-pollution action in each state; (2) - studies and research; organisation, co-ordination and results; (3) - methods and equipment which can be used to reduce pollution; and (4) - anti-pollution legislation in Europe.**

03128

C. Padovani

METHODS OF REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES (CHAPTER V, OIL INDUSTRY). European Conf. on Air Pollution, Strasbourg, 1964. pp 323-36.

One general observation that can be made concerning the national reports received is that the information they contain is not full enough or specific enough particularly as regards pollution statistics, the cost of anti-pollution equipment and the results obtained. Furthermore, as regards sources of pollution and methods of control, the reports mention nothing which cannot be found in technical literature. Recent years have seen enormous refinery development in Europe owing to a steady increase in consumption and the transfer of processing plants from the areas where the crude oil is obtained to those where petroleum products are consumed. There are also signs of a tendency to concentrate production in increasingly large refineries and of a continuous increase in secondary or vertical refining processes as compared with primary or horizontal refining processes. The pollution problem has naturally been aggravated by the tendency to bring refineries closer to consumption areas. By their very appearance, the enormous size of the storage tanks, the tall distillation towers, the flares for burning the surplus gases, petrol refineries make a strong impression on the public at large and give rise to suggestions out of all proportion to the actual threat presented to public health. It should further be pointed out that the European oil industry was almost completely reconstructed after the second world war and that, even in the field of pollution control, it is in the van of progress. However, the oil industry still needs to improve on the measures it has adopted.**

03129

Avy., A. P.

METHODS OF REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES. (CHAPTER VI, CHEMICAL INDUSTRY). European Conf. of Air Pollution, Strasburg, 1964. p. 337-356.

The pollutants discharged by the chemical industry may be subdivided into several classes. The first and most important class is that of harmful products emitted in large quantities by the "heavy" chemical industry and, in particular, organic chemical works: Sulphur dioxide, sulphuric acid, chlorine, whether manufactured or in the form of impurities in the basic material; fluorine in the case of fertilizers and fluorine again in aluminum electro-chemistry. The chemical industry has a wide

range of special problems which is in a constant state of flux owing to the wide and ever-increasing variety of new synthetic products (intermediate and finished) in the organic chemical industry. From the technical point of view, the prevention of pollution by such products depends on their presentation and manner of application. A problem directly connected with chemical manufacture is that of smells: mercaptans, hydrogen phosphide, methylamines, etc., although, of course, it does not arise in the chemical industry alone. Technical methods used to reduce pollution are highly developed for dusts and smoke and there is a wide choice of apparatus. The chemical industry, like all others, is subject to laws and regulations governing industrial air pollution. A fairly sharp distinction, however, should be drawn between laws, which lay down in general terms the objects to be attained and the obligations to be fulfilled, and the regulations which embody details of the limits imposed and the degree of reduction demanded. In this last report, caution is necessary and impossible or unnecessary standards should not be set. It is clear that international liaison or even international collaboration is not only desirable, but necessary.##

03158

N. C. Rollos

UTILISATION OF AMMONIA AS AN ALTERNATE FUEL IN ARMY AIRCRAFT ENGINES. Army Aviation Material Labs., Fort Eustis, Va. (Technical Report No. 66-52.) June 1966. 60 pp.
CFSTI, DDC AD 638160

The successful application of the Nuclear Powered Energy Depot Concept is partly dependent upon the practicability of ammonia-fueled gas turbine engines. The purpose of this investigation was to assess the feasibility of ammonia-fueled gas turbine engines in Army aircraft. In accordance with this objective, engine performance in the UH-1D helicopter and in the CV-7A fixed-wing aircraft was compared utilizing both hydrocarbon and anhydrous ammonia fuels. Aircraft fuel system requirements were investigated, and an elementary cost comparison was made for engine conversion kits and production engines. Engine maintenance was considered briefly. From this study, it is concluded that the use of ammonia as a gas turbine fuel results in considerably lower aircraft productivity than the productivity obtained from the use of hydrocarbon fuels. (Author abstract)##

03169

R. F. LaPerre

INVESTIGATION OF THE AUTOXIDATION OF PETROLEUM FUELS (INTERIM REPT.). Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (CCL Rept. 304) (Project 1C024501A106). JUNE 1966. 24 PP.
CFSTI,DDC AD 641270

The deterioration of petroleum fuels was studied by investigation of their autoxidation susceptibilities. Federal and Military

Specification fuels and commercial gasolines were subjected to a six-week accelerated aging test with analyses for generated hydroperoxides determined at weekly intervals. The resulting peroxide-time curves revealed autoxidation tendencies to vary considerably. Under the conditions of this aging technique, there is evidence that the bulk storage supply of combat gasoline (MIL-G-3056B) at Aberdeen Proving Ground is experiencing a gradual depletion of antioxidant quality. (Author abstract)**

01202

V. Del Vecchio.

THE PROBLEMS OF BASIC URBAN AIR POLLUTION. Il problema dell'inquinamento di fondo urbano dell'aria atmosferica. Fusi Foiveri (Milan) 8, (6) 177-8, June 1966.

Basic urban air pollution refers to the discharge into the air of exhaust gases from motor vehicles and from heating units, which are prevalently inefficient. Both sources discharge respirable dusts and gases, the latter including some aliphatic and aromatic hydrocarbons which have proven carcinogenic in experimental animals. The problem arising from the incomplete combustion of motor fuels is aggravated by the presence, in Italian cities, of narrow streets and relatively high buildings which become repositories of emitted fumes and dust from slow-moving vehicles. As much as 12 to 13% CO may be present in gasoline-driven motor car exhaust. While gross measurement of pollutants present in the urban air is of high indicative value, public health aspects of the problem demand that granulometric studies of the dust particles also be conducted, since size is a factor in respirability. In addition, photochemical studies involving the interaction between the pollutants in the air and the sun's rays indicate that solar radiation transforms the originally present contaminants into biologically more receptive compounds, quite different from their precursors. Thus peroxyacetylnitrate(PAN) is produced from NOx, and the new substance is a powerful irritant of the mucus membranes. The dramatic episodes of mass illness resulting from smog in various places in recent years were caused by the phenomenon of thermal inversion which prevented the dispersion of the irritants present in the air.**

01255

R. L. Cumming and V. J. Konopinski

MOTOR VEHICLE EXHAUST CONCENTRATIONS IN A ROAD TUNNEL. Preprint. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., Apr. 29, 1964.)

The contribution of motor vehicle exhaust to ambient air pollution was studied by using a vehicular-road tunnel as a sampling site. An intensive aerometric study was conducted April 20 through 28, 1963, at the Sumner Tunnel in Boston, Massachusetts. The tunnel is now operated as a one-way tube. Air quality was determined on the fresh air supplied to the tunnel (inlet air), on

the air exhaust from the tunnel (exhaust air), and at three sites within the tunnel. Particulate pollutants were analyzed for total suspended particulates, benzene-soluble organics, sulfates, nitrates, metals, and polycyclic hydrocarbons. Concentration of SO_2, oxides N, NO_2, aliphatic aldehydes, and CO were also determined. The average concentration of total suspended particulates in the inlet air was 88 micrograms/cu m while that of the exhaust air was 424 micrograms/cu m. The concentrations of total particulates, benzene-soluble organics, sulfates, and nitrates for the inlet and exhaust air were less than reported in a previous study. The ranges of concentrations of oxides N, NO_2, and aliphatic aldehydes in the tunnel were, respectively, 11.3 to 43.0, 3.5 to 8.8, and 3.1 to 12.6 parts per hundred million (hereafter referred to as pphm). SO_2 concentrations ranged from 0.1 to 0.5 pphm, and were less than ambient concentrations. The mean daily concentration of CO was 2.3 ppm in the inlet air and 50.8 ppm in the exhaust air. Mean concentrations in the tunnel ranged from 20.5 to 54.2 ppm and increased with increasing distance into the tunnel. Other pollutants exhibited a similar gradient. The particulate pollutant concentrations measured during April 1963 study are less than those measured in 1961. This decrease may be attributable to operation of the tunnel with one-way traffic and the concomitant piston effect, and to a 36 percent decrease in the average number of motor vehicles using the tunnel. Values for polycyclic hydrocarbons reported for the 1961 study were in error; corrected values are given in this report. (Author abstract)**

01264

J. N. Pattison and E. R. Stephens

COMPOSITION OF AUTOMOTIVE BLOWBY GASES. Proc. Tech. Meeting West Coast Sect., Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 37-50 pp.

Blowby emissions from internal combustion engines have been analyzed, and it has been experimentally shown that they have the same carbon content as exhaust and carbureted mixture. It has also been found that blowby is composed of approximately two-thirds carbureted mixture and one-third exhaust. Gas chromatographic analyses have been made of the blowby from ten cars using the same fuel, and it was found that the ratio of one component to the next (in the C1 to C5 range) was very similar for all cars and that the total emission level only varied by a factor of 2 or 3. Cracked products accounted for about one per cent of the organic carbon in blowby. The actual concentration of these compounds was found to be the same in blowby and exhaust, which indicates that some reaction occurs during the compression stroke before any appreciable amount of blowby occurs. Gas chromatographic analysis of the aromatic portion of the blowby showed variations similar in amount to that found in the light hydrocarbons. The composition of the blowby aromatics resembles the composition of the fuel. (Author summary)**

01265

A. F. Bush, P. A. Sisters, C. Richards, and J. Dyer

EFFECT OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. (Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1953.)

"Typical" smog damage of the conventional type is induced in Nicotiana glutinosa when the ratio of pure air to automobile exhaust is in the range of 1000 to 1 in the test facility. A specific cycle of engine operation involving acceleration, cruise, deceleration and idle produced typical damage. The absence of cruise in the cycle caused no damage to occur. With an after burner on the exhaust of internal combustion engines, it becomes apparent that a new type of injury was being induced in Nicotiana glutinosa plants. Fumigations with afterburner exhausts consistently produced atypical plant damage, whereas automobile exhaust fumigations, without afterburner devices, usually produced typical oxidant damage. It is considered that since the concentration of hydrocarbons is reduced using the afterburner, one of the principal air polluting agents has been eliminated; typical air pollution therefore, does not occur. This does not mean that plant damage is eliminated, only that the usual type of plant damage appears to have replaced it (atypical). Some of the exceptions to the trends described in #1 above can be explained on the basis of lack of sweep of the tunnel so that residual smog-forming materials may have remained behind. The tunnel must therefore be carefully swept with air passed through beds of activated charcoal for at least 15 hours before the fumigation can have validity. Plant damage does not correlate well with measured concentrations of nitric oxide. Atypical damage is produced however in almost every instance of afterburner exhaust fumigation. Since the fumigation period includes the period when the oxides of nitrogen are high (ppm or so) it may be speculated that the new damage is due to oxides of nitrogen in the absence of high hydrocarbon. There is fair correlation between hydrocarbon concentrations and the appearance of typical damage when no afterburner is used. Afterburner exhaust in the chamber showed no appreciable human eye irritation resulting from the new atmosphere while automobile exhaust without afterburner produced eye irritation of the type described by Buchberg. (Author conclusions)##

01552

J. F. Norris and A. B. Calongne

CONTAMINATION GENERATION OF INTERNAL COMBUSTION ENGINES. Preprint. (Presented at the Fourth Annual Technical Meeting and Exhibit, American Association for Contamination Control, Miami Beach, Fla., May 25-28, 1965.)

The contamination generated by various types of mobile equipment used to support inplant operations was studied at the NASA Michoud Operations in New Orleans. The contamination sensitivity of various systems on the Saturn C-1C made it mandatory that all contamination generating operations be studied in order to effect the best possible control. Vehicles used

inplant had to be selected on the basis of minimum contamination generation. The exhaust gases of six vehicles were tested to determine the generated waste products. One of these vehicles was a crane that had two separate engines which increased the number of tests to seven. Two 4,000 pound fork lifts; a 6,000 pound fork lift; a crane mobile power motor; and a crane boom motor, all powered with liquid petroleum gas; and a gasoline powered 6,000 pound fork lift and a Diesel fuel air compressor were the vehicles used for these tests. The exhaust gases from each engine were analyzed on a Fisher Orsat apparatus for the following constituents: carbon dioxide, oxygen, carbon monoxide, hydrocarbons, hydrogen, water (calculated), and nitrogen (calculated). In addition, the sampling tubes from each vehicle were saved and photographed to show, candidly, the particulate and oily contamination which was generated. The results of this test show that all of the internal combustion engines are contamination generators. The amount of contamination generated is dependent upon two factors: (1) Condition of the engine, and (2) Efficiency of engine operation. In some cases, the carbon monoxide content was high enough to present a health hazard if the vehicles were operated in a confined space. Cleaning by trichlorethylene and by hot alkaline is not adequate if carbonaceous particles from internal combustion engines contaminate parts. Engines must be kept in perfect condition. Exhaust gases should be analyzed frequently to determine engine conditions. Water-cooled manifolds or water mufflers should be used to precipitate contaminants. Exhaust gases should be filtered.##

01420

A. H. Rose, Jr., H. H. Black, R.C. Manta

AIR AND WATER POLLUTION STUDIES RELATED TO PROPOSED PETROLEUM REFINERY FOR SAND ISLAND - OAHU, TERRITORY OF HAWAII (=REPORT TO BOARD OF HEALTH, TERRITORY OF HAWAII). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Dec. 1955. 60 pp.
NSW

The objective of the atmospheric pollution phase of this study was an evaluation of the possible effect on the atmosphere of the City of Honolulu which may result from the operation of a 28,000-barrel-per-day modern fluid catalytic cracking refinery. Two factors were investigated, first the extent and causes of the current atmospheric pollution level, and second the potential impact on the pollution level which may result from the refinery operation. Process design for the proposed refinery was tentative in that only process flow and major process units were fixed; interflow of components between process units and their elements had not been finalized. Data covering the operation of and atmospheric contaminant discharge from existing industrial operations were relatively meager. Data on the concentrations of specific contaminants in the Honolulu atmosphere were not available. Only published climatological data were available. The quantity of specific atmospheric contaminants from both existing sources and the proposed refinery are presented as determined from the best available data.##

01561

B. J. Steigerwald

CARCINOGEN APPRAISAL STUDY. Preprint. 1960.

The purpose of this study is the development of sampling and analytical techniques which will allow and encourage more widespread source and air sampling and analysis for suspected carcinogenic and cocarcinogenic compounds. A sampling program for the first year has been worked out which allows rapid advancement toward the goals outlined: development of source sampling techniques for the appraisal of carcinogens in hot stack gases, and exploration of the possibility of correlating short chemical tests for aromatics, or indicator tests for CO with the aliphatic and polynuclear aromatic content of combustion gases or automobile exhausts. Development of routine analytical methods for long-chain aliphatics. Some estimates of the possible importance of many other industrial sources of these compounds. Additional information on the distribution of heavy hydrocarbons in urban areas, and estimates of possible maximum exposure levels of polynuclear aromatic and long-chain aliphatics near some of the suspected sources of such emissions. A broad screening of the emission of polynuclear aromatic hydrocarbons and aliphatic from major combustion sources and the development of emission factors for automobile internal combustion engines.##

01562

A. H. Rose, Jr. and R. C. Stahman.

THE ROLE OF ENGINE BLOWBY IN AIR POLLUTION. J. Air Pollution Control Assoc. 11, (3) 119-7, Mar. 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The results are presented of a survey of 13 late model cars in which measurements were made of the concentration and quantity of both crankcase and exhaust gas emissions during various modes of vehicle operation. Measurements of CO2 concentration and flow rate have established that the composition of the blowby gas is approximately 75 to 85% carbureted fuel-air mixture. As such, the specific composition of the crankcase gases will be controlled by the composition of the fuel used in the engine. A high correlation was found between manifold vacuum and both blowby emission rate in cfm and gross emission in pounds per hour. Both factors decrease with increasing manifold vacuum resulting in substantially zero emissions at the low manifold vacuums associated with closed throttle deceleration. A further effect also apparent from the data is a twofold increase in crankcase emission rate and gross emission for the eight cylinder engine as compared to the six. The effect of these variables for all driving conditions was based on the average driving cycle developed by the Traffic Survey Panel of the Automobile Manufacturers Association. It was found that crankcase emissions account for 20% of the over-all automotive emission for the six cylinder engine and 11% for the eights.##

01580

P. A. Bennett, R. W. Jackson, C. E. Murphy, and R. A. Randall

REDUCTION OF AIR POLLUTION BY CONTROL OF EMISSION FROM AUTOMOTIVE CRANKCASES. Vehicle Emissions (Selected SAE Papers) 5, 224-51, 260, 1966. (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 11-15, 1960.)

Analyses of crankcase vent gases by several methods have shown that crankcase and exhaust hydrocarbon emissions from automobiles are of the same order of magnitude. Internal ventilation of the crankcase to the engine intake system eliminates crankcase emission, thus providing a practical control of this important source of air pollution. (Author abstract)##

01584

G. B. Cann, W. A. Noble, and G. P. Larson

DETECTION OF SMOG FORMING HYDROCARBONS IN AUTOMOBILE EXHAUST GASES USING PLANTS AS INDICATORS. Air Repair 6, (2) 81-6, Aug. 1956.

Following the identification of hydrocarbons in the 4, 5 and 6 carbon atom range in automobile exhaust gases, it became necessary to determine whether these hydrocarbons, mixed with other exhaust gases, could produce typical smog effects. A study was carried out in which the atmospheric reaction of hydrocarbons was duplicated in the Air Pollution Control District's plexiglas house. Certain plants, which had already been proved susceptible to smog damage, were used as indicators. Gasoline vapor was used as the standard against which the plant damaging effects of automobile exhaust gases were compared. Results show that automobile exhaust hydrocarbons are capable of producing effects equivalent to those resulting from smog. (Author abstract)##

01761

F. F. Nader, R. Rye, J. A. Orcutt, and L. A. Chambers

EFFECTS OF FUEL OLEFIN CONTENT ON COMPOSITION AND SMOG FORMING CAPABILITIES OF ENGINE EXHAUST (INTERIM REPT. 2). Los Angeles County Air Pollution Control District, Calif. Apr. 1959. 28 pp.

A proportionate sampling system was used which made it possible to collect continuously representative composite exhaust samples from all all driving cycles in proportion to exhaust volume, under actual driving conditions. Six gasolines, with olefinic contents ranging from 1.0% to 30.9% were used (bromine number 1.6 to 69.4). The exhaust was irradiated for one hour by means of mercury lamps. A panel of laboratory personnel (usually eight in number, but never less than six) was then exposed to the contents of the flask by the use of a specially designed eye mask, which fitted the mouth of the flask as well as the eyes of the individual. The eye piece was built with a shutter to open and close quickly, thereby

enabling an exact measurement of time of exposure. The number of seconds required for each individual to detect the initial eye irritation was recorded, and the arithmetic mean of the observations was calculated as an index of the eye irritation potential of the exhaust sample. The olefin content of the fuels used to drive the automobiles is directly related to the quantities and relative distributions of olefins in the exhaust. The amount of olefins present in the exhaust is directly related to the intensity of eye irritation which is produced when the exhaust gases are irradiated. Since a direct relationship exists between olefins in fuels and olefins in the engine exhaust on the one hand, and between exhaust olefins and eye irritation on the other, it is reasonable to assume that the determination of total exhaust olefin indicates the intensity of eye irritation that can be expected from a given fuel composition.##

03871

L. B. Hitchcock

AIR POLLUTION AND THE OIL INDUSTRY. Proc. Am. Petrol. Inst., Sect. IV, 35, 150-4, 1955. (Presented at the spring meeting, Pacific Coast District, American Petroleum Inst. Division of Production, Los Angeles, Calif., Apr. 28, 1955.)

While most of Los Angeles' air pollution is traceable to petroleum products, by far the largest share arises from the use to which these products are put. Motor-vehicle exhaust accounts for the largest single source of pollution. Fuel oil and gas also contribute. Incineration of refuse and metallurgical and miscellaneous industrial emissions account for most of the balance. The public, through its motor vehicles and rubbish burning, contributes more than half the total pollution. The oil industry, indispensable to the community's growth, has done more than all the rest of the area in developing and adopting corrective measures, and has reduced its emissions very substantially. Petroleum production in Los Angeles County contributes a very minor part to air pollution. Hydrocarbons and nitrogen oxides in combination produce smog effects, although neither alone, at concentrations found, is known to be deleterious. Cleaner air costs money, but less than smog. Intensive application of science and engineering to the overall problem is the only road to success. (Author abstract)##

03881

E. A. Schuck and G. J. Doyle

A STUDY OF IRRADIATED AUTO EXHAUST. Stanford Research Inst., South Pasadena, Calif., Southern California Labs. (Rept. 9 and Technical Rept. 11.) Feb. 1958. 65 pp.

Aerosol was formed by irradiation of exhaust-air mixtures. The aerosol thus formed was in the submicron size region but was of sufficient concentration to reduce visibility appreciably--in some instances from around 40 miles down to 2 or 3 miles. The severity of eye irritation is dependent on the concentrations of

hydrocarbons and nitrogen oxides. More particularly, a relationship has been established between the concentration ratio of hydrocarbons and oxides of nitrogen and the degrees of eye irritation, the degree of irritation being dependent on the concentration ratio. This ratio also influences the rate of formation of the aerosol, oxidant, and indicated nitrogen dioxide. Varying the relative humidity in the exhaust-air mixtures between 40% and 80% and the temperature between 25 C and 40 C had no detecta le effect on any of the measured symptoms. Eye irritation increased as the light intensity was increased from zero to 1/4 the intensity of noonday sunlight, but did not appear to increase with a further increase in intensity up to about twice that of noonday sunlight. Eye irritation intensity was found to be a function of residence time under irradiation. The results indicate that the length of time that pollutants reside under irradiation has an effect on the severity of smog symptoms, i.e., leads to an increase and then a decrease in eye irritation with time. The smog potential from an auto exhaust mixture appears to be intimately associated with hydrocarbon concentration, oxides of nitrogen concentration, the concentration ratio of hydrocarbons to oxides of nitrogen, light intensity, and residence time under irradiation. The half life of the eye irritant produced by irradiating dilute auto exhaust was determined to be in the order of 24 hr, indicating the presence of a rather stable irritant. The half life of the aerosol was found to be 12 hr, and that of the oxidant or indicated nitrogen dioxide was less than one hour. Thus, from the measure of half life, the aerosol, oxidant, and indicated nitrogen dioxide do not appear to be intimately associated with eye irritation.##

03887

F. J. Sweeney and C. E. Heath

THE FUEL CELL: ITS PROMISE AND PROBLEMS. Proc. Am. Petrol. Inst., Sect. III 41, 131-6, 1961. (Presented at the 26th Midyear Meeting, American Petroleum Inst. Division of Refining, Houston, Tex., May 9, 1961.)

The inherent high efficiency of the fuel cell and its promise of simple, trouble-free conversion of chemical energy to electricity have prompted a research effort which extends to approximately 100 laboratories throughout the world. This paper discusses the advantages of the fuel cell and the chemical and engineering problems to be solved before its potential is realized. Recent work has encouraged the prospects for development of a general-purpose fuel cell. The question of its ultimate technical and economic feasibility will depend on making the cell work efficiently and dependably on conventional fuels and air. (Author abstract)##

03935

I. M. Shahad, A. V. Sheeine, V. S. Fridman

POSSIBLE CONTAMINATION OF CHEMICAL PRODUCTS WITH 3,4-BENZPYRENE DURING THEIR MANUFACTURE. Hyg. Sanit. 31, (4-6) 304-6, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

Increasing attention is directed to the possible carcinogenic effects of different industrial products with which man may come into contact in the course of manufacture or consumption. The relationship between the manufacture of ammonium sulfate and coking industry led to the investigation of industrial samples for their contents of 3,4-benzpyrene. The samples were investigated according to the following scheme: A 10-g sample was repeatedly washed, with vigorous shaking, with distilled benzene until the resulting benzene extracts were no longer luminescent. Luminescence was induced with filtered light from a mercury lamp. This was followed by measurement of the volume of the extract and by quantitative analysis to detect 3,4-benzpyrene. Quantitative determination of 3,4-benzpyrene was made by the method of addition from the fluorescence spectrum of the n-octane solution at 77K. The sample contained 1400 micrograms 3,4-benzpyrene per 1 kg ammonium sulfate. The contents of this carcinogenic hydrocarbon exceeded 1000 micrograms per 1 kg in all investigated samples.**

05989

J. H. Freeman, Jr.; H. C. Stahman

FUEL INJECTION INCREASES ECONOMY REDUCES EXHAUST EMISSIONS. S.A.E. (Soc. Automotive Engrs.) J. 74, (10) 70-5, Oct. 1966

The standard carburetors on three test cars were replaced with a fuel injection system. The automobiles were tested on a chassis dynamometer and on four driving routes. Fuel consumption, CO2 and hydrocarbon emission were reduced.**

06008

J. T. Gray, Jr.; E. Dimitroff, N. T. Meckel, and R. R. Quillian, Jr.

AMMONIA FUEL - ENGINE COMPATIBILITY AND COMBUSTION. S.A.E. (Soc. Automotive Engrs.), Preprint. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

Full-scale engine studies were conducted to determine the feasibility and compatability of ammonia combustion in various systems. Briefly outlined is the spark-ignition investigation undertaken by the Army Laboratory to learn the potential and effect of ammonia as a fuel and to study the influence of engine variables on combustion. A study of compression-ignition performance was made to ascertain the ability of ammonia to be pumped in existing injection systems and various means of achieving ammonia combustion were explored. Compatibility of ammonia and its combustion products with engineering materials and lubricants presents no substantial problem. Satisfactory delivery of ammonia may be accomplished by cooling the inlet to the injection pump. Ammonia-only combustion requires high compression ratios and temperatures (35:1 compression ratio, 300 F air and coolant). Ammonia may be ignited by pilot fuels at compression ration as low

04028

R. E. Kruse and D. R. Hill

EXHAUST EMISSIONS FROM COMPACT CARS. Preprint. (Presented at the Society of Automotive Engineers Meeting, Dayton, Ohio, Mar. 14, 1957.)

The purpose of this study was to develop basic emission data that will provide background information for the setting of Federal emission standards that weigh as equitably as possible the relative contributions to air pollution of different passenger cars varying both in gross vehicle weight and in engine displacement. This was accomplished by determining for a variety of imported and domestic compact vehicles the concentrations and mass levels of emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen during operation on the road and on a chassis dynamometer (7-mode cycle, hot start). The compact vehicle was defined as any car weighing less than 3,000 pounds with an engine displacement of less than 200 cu. in.##

04029

F. A. Gofmekler, M. D. Manita, Sh. V. Manucadshants, and L. L. Stepanov

CORRELATION BETWEEN 3,4-BENZPYRENE AND CARBON MONOXIDE CONCENTRATIONS IN AUTOMOBILE EXHAUST GASES. Gigiena i Sanit. 26, (6) 3-8, Aug. 1961. Russ. (Tr.) (Translated by M. S. Levine in U.S.P.H. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

One of the most widely occurring cancerogenic substances in ambient air, 3,4-benzpyrene, is also a component of automobile exhaust gases. Seemingly, there exists a correlation between the formation and discharge of 3,4-benzpyrene and carbon monoxide, as both may result from incomplete liquid fuel combustion. A better understanding of this 3,4-benzpyrene and carbon monoxide correlation in dealing with the problem of sanitary protection of atmospheric air was the aim of this investigation. Concentrations of 3,4-benzpyrene in auto exhaust gases were determined by the spectral-fluorescent method. Carbon monoxide concentration in automobile exhaust gases ran in correlation with the concentration of simultaneously occurring 3,4-benzpyrene; accordingly, CO concentration can be used as an indicator of the rate at which 3,4-benzpyrene is discharged into the atmosphere with the automobile exhaust gases. Automobiles with properly adjusted carburetors generated and discharged into the atmospheric air less carbon monoxide and less 3,4-benzpyrene. The highest concentration of 3,4-benzpyrene and of carbon monoxide was discharged with exhaust gases coming from automobiles operated at low rpm, usually at the ratio 12:1, depending upon the cetane number of the pilot. None of the fuel additives investigated significantly lowered the energy level requirement for ammonia ignition. Gases introduced into the intake manifold resulted in ammonia combustion although amounts required were high: (10% hydrogen, 15-20% acetylene). High temperature glow coils were suitable ignition sources but spark plugs and standard glow plugs failed to initiate combustion.##

tion of starting or accelerating atmospheric air pollution with 3,4-benzpyrene and carbon monoxide can be reduced substantially as follows: by controlled carburetor operation at all times, particularly when starting and moving into line with the traffic, and most of all by keeping the carburetor clean and well adjusted; by reducing to a minimum the number of stops and starts at cross sections and light signals. This can be done by proper manual and signal traffic regulations and by instituting overhead and underground auto routes which would allow automobiles to travel without making many stops.##

04108

M. Ya. Yanysheva, I. S. Kireeva, and M. N. Serebrantova

3,4-BENZPYRENE IN CRUDE OIL AND IN BITUMINOUS PRODUCTS. Gigiena i Sanit. 28, [11] 71-10 Nov. 1963. Russ. [Tr.] (Translated by H. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)
UPATI: 77 66 61429

The present authors investigated the 3,4-benzpyrene concentrations in crude oil tars of different trademarks. The investigation aimed at finding which of the products contained the least amount of 3,4-benzpyrene so their use could be recommended in the place of other products which contained higher cancerogenic hydrocarbon concentrations. The investigation included crude oil, tar and pitch products trademarked BB-IV and VB-V, obtained from cracking residuals BB-V produced by the Sheraon plant. This plant processed crude oil coming from the Ukraine and partly from Povolsh'ya. Samples for the investigation came in a variety of forms of processed crude oil, such as crude oil asphalt resulting from direct vertical crude oil distillation, and cracking residuals resulting from processing crude oil break down products. The composition of products resulting from direct vertical crude oil distillation depended largely upon the nature of the crude oil, and the composition of cracking products characterized by high content of aromatic polycyclic hydrocarbons is determined basically by the production technology. Trademarked crude oil bitumens are distinguished by their melting point and viscosity. Results indicated that even the maximal 3,4-benzpyrene concentrations found in the crude oil tar residues were considerably below the maximal concentration of 3,4-benzpyrene found in coal pitch. Therefore, it appears that replacing the coal tar pitch as a binder by crude oil tar residue should reduce considerably the amount of cancerogenic coal products in coal dust briquettes. It should be remembered, however, that crude oil tar residue binders may contain cancerogenic substances other than 3,4-benzpyrene, the concentration of which may be different in different types of the crude oil binders. In view of this, final recommendations for the use of the safest crude oil residue binders of different trademarks should be based on experimental studies with animals.##

04119

M. V. Dmitrieva, A. I. Rukhovkaya, and I. S. Khasanov

METHODS FOR LOWERING SOLVENT CONCENTRATIONS IN THE AIR OF PLANTS ENGAGED IN DRY CLEANING CLOTHES. Gigiena i Sanit. 28, [12] 71-3, Dec. 1963. Russ. [Tr.] (Translated by H. S. Levine in

U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: TT 66 61429

Indoor air pollution with organic solvent vapors in dry cleaning plants constituted a hazard to the health of the workers. The following air pollution sources were found in dry cleaning plants: open manual method of applying solvents in the spot removing department; non-observance of safety regulations; primitive and manual technological procedures in loading and unloading the rotating cleaning drums; unorganized leakage, etc. The method used in unloading dry cleaned clothes from the solvent containing drums constituted a particularly hygienically unfavorable condition. Comparative evaluation of equipment and machines used showed that highest solvent vapor air pollution was noted in dry cleaning plants equipped with USA machines. Therefore, it is recommended that the use of American machines be discontinued. Prevention of air pollution with solvent vapors in dry cleaning plants can be attained by the following means: (a) strict adherence to most advanced technological defatting processes; (b) elimination of all leakage sources, especially in the pipes and conduits; (c) installation of a properly planned up-to-date overall ventilation system supplemented by the installation of local exhaust devices at points of workers exposure to the inhalation of the solvent vapor polluted air. The present practice of manual spot removing from clothes in the open should be unconditionally prohibited, appropriate local exhaust ventilation devices be installed; the rate of fresh air inflow should be increased. Employees of dry cleaning establishments should be examined periodically by industrial medical personnel, and persons unfit for such occupation should be replaced. (Author conclusions)**

042111

A. B. Poirier

ENGINEERING INVESTIGATION OF DIRECT LIQUID HYDROCARBON-AIR FUEL CELLS. (FINAL TECHNICAL REPT). ONAN Engine-Generator Div. of Studebaker Corp., Minneapolis, Minn. (Rept. No. 2.) Dec. 11, 1966. 50 pp.
DDC: AD 807798L

The objective was to perform preliminary engineering design studies that will lead to the development of a direct liquid hydrocarbon-air fuel cell power plant operating on logistic military fuels at moderately low temperatures. The basic cell design approach is a matrix-type using phosphoric acid as the electrolyte. Commercially available electrodes were evaluated for their electrical performance in direct liquid hydrocarbon-air fuel cells. American Cyanamid electrodes, type 1-AA, show promise as both hydrocarbon and air electrodes with phosphoric acid electrolyte at temperatures below 200 C. These electrodes have delivered as high as 10 watts/square foot on JP-4, 15 watts/square foot on combat aviation gasoline, and 60 watts/square foot on propane. Air was used as the oxidant in all three cases. There is a strong influence on the initial performance of the present American Cyanamid hydrocarbon electrodes with platinum loadings under 30 grams/square foot. Higher anode platinum loadings lose their sensitivity to initial performance, but become important in the operating life of the electrodes. Humidification of the fuel was found to have a pronounced effect on the

electrochemical performance. As much as 10-fold increase in the power output of the JP-4 fuel cells was observed upon humidification of the fuel feed. A six-cell matrix-type module, employing 1/4 square foot electrodes, was fabricated and tested. Gas leakage problems at operating temperature were encountered. The cause of the gas seal failure was attributed to the "flowing" of the hypalon asbestos gaskets under compressive loading at operating temperature. A new current collector was designed to employ silicone "o" rings along its perimeter. The Hydroform Process which uses only one machined die was found suitable for fabricating a variety of current collector designs at low cost. A design layout of a direct liquid hydrocarbon-air fuel cell system was established. The total weight and volume estimates of a state-of-the-art 1 KW direct JP-4/air fuel cell system are 620 pounds and 12 cubic feet respectively. The high system weight is contributed primarily to the present-day performance of the electrodes on JP-4 fuel.##

042134

J. V. Pustinger, Jr.; F. N. Hodgson, and N. D. Ross

IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS, Monsanto Research Corp., Dayton, Ohio. (Rept. No. AMRL-TR-66-91,) June 1966. 210 pp.
CFSTI: AD 642054

Fifty-five candidate materials for space cabin construction were stored for 30, 60 and 90 day periods at 23-25 C, and 20-40% R. H. in environments of air at a pressure of one atmosphere and oxygen at 5 psia. The composition of the gas-off products was determined by mass spectrometry and gas chromatography. Considerable amounts of gas-off products were detected from candidate materials prepared immediately prior to testing, e.g., coatings, paints, and adhesives. Very little, if any, gas-off products were evolved from materials submitted as fabricated sections, e.g., polycarbonates, polyvinyl-fluorides, and nylon based material. In general, the major gas-off products were solvents, plasticizers, and monomers. Some coatings described considerable amounts of carbon monoxide. Others gave off relatively large quantities of trimethyl silanol and low molecular weight methyl siloxane polymers. Although slight differences in relative amounts of alcohols and aldehydes were observed in some gas-off atmospheres, no large changes in atmospheric composition were observed that could be attributed to increased oxidation when materials were exposed at 23-25 C to oxygen at 5 psia. Quantitative analyses of the gas-off products were influenced by: uniformity of sample lots, sample homogeneity, freshness of sample, free surface area, adsorptive characteristics of the encapsulating chamber, method of sampling the gaseous atmosphere, and method of analysis. Additional analyses were performed on desorbates from four carbon canisters from space cabin simulators and the hydrolysis products of RCS 198. (Author abstract)##

042721

G. J. Adlhart and A. J. Hartner

FUEL CELL CATALYSTS (REPT. NO. 3, THIRD QUARTERLY REPT.-NOV. 1, 1965 TO JAN. 31, 1966). Engelhard Industries, Inc.,

Newark, N. J.: Res. Dev. Div. May 1966. 36 pp.
DDC: AD 482110L

The work consists of an investigation of fuel cell catalysts permitting complete oxidation of hydrocarbon fuels under conditions which all reaction products are rejected from the electrolyte. Anodic catalysts and catalysts for oxygen reduction were evaluated. A study was carried out on fuel cell catalyst carriers used in oxidation of hydrocarbons. The carriers studied were graphite, boron carbide, and because of its specific grain structure industrial diamond. The crystallite sizes of the applied noble metal and its distribution on the carrier were determined by X-ray and electron micrographic techniques. It has been demonstrated that whereas certain carriers may ensure the deposition of platinum with the desired small crystallite size, they may not be able to retain it on their surface in a uniformly distributed fashion. At an unfavorable and low surface area of the carrier the noble metal may agglomerate or even separate from the carrier. The anodic oxidation of propane and of carbon monoxide containing hydrogen has been studied on supported catalyst. For both types of fuel, utilization of precious metal is improved by dispersing the metal on a carrier. Of the carriers tested, graphite was found to be the best carrier for the oxidation propane. Alloying supported platinum pith ruthenius is particularly beneficial for the oxidation of carbon monoxide containing hydrogen. On the cathode the amount of precious metal needed for a given current output could not be substantially decreased by the use of catalysts on carrier.##

04315

AUTOMOTIVE AIR POLLUTION (A REPORT TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206, THE CLEAN AIR ACT). 89th Congress (1st Session.) (Document No. 7.) 1965. 36 pp.

Based on the information presented in this report the following conclusions are made: (1) That all necessary steps should be taken to ensure the reduction of pollutant emissions from motor vehicles. For this purpose, there is need for (a) further development of emission criteria, and (b) development of means for insuring the national application of currently available technical knowledge for reduction of such emissions; (2) That the need should be recognized for an expanded automotive vehicle air pollution research program to accelerate further development of emission criteria and improve technical capabilities for controls on automotive vehicles; (3) That means be developed through vehicle inspection programs or otherwise to insure appropriate maintenance of vehicle emission control systems; and (4) That all practicable measures should be taken to expedite the flow of traffic in urban areas, since this will, in itself, accomplish significant reduction in vehicle pollutant emissions.##

04316

FUEL CELLS. FOA Orienteras 08 (5) 28-9, Apr. 1966.

The fuel cell has many acceptable properties. It has a high efficiency, 60-80%, which means that with a given amount of fuel a long time of action is obtained. Operating costs moreover remain very low as cheap fuel can be utilized. Since the fuel cell lacks movable parts it operates quietly and in addition has a

greater effect per unit weight and volume than the conventional battery. The fuel cell is utilized in applications where the properties quoted are particularly valued. For current maintenance of space ships for instance a high effect per unit weight and volume is required with maximum utilization of the fuel. Fuel cells answer this need perfectly, and they are used in fact in the space capsules in the American Gemini project and will be utilized in the Apollo project. The fuel cell is ideal for submarines. No interruption for charging is required. Swedish, German, and American developments are reviewed with special mention of cells for hydrocarbon fuels.##

04567

B. G. Gills, E. L. Rose

OIL BURNERS FOR DOMESTIC USE: PRESENT STATE, RECENT IMPROVEMENTS AND FUTURE DEVELOPMENTS. (Olbrenner für den Hausbrand: Gegenwärtiger Stand, erzielte Verbesserungen und Möglichkeiten der Weiterentwicklung.) Schweiz. Arch. (Zurich), 31(4):119-126, April 1965. 7 refs.

An oil furnace well built and maintained should cause no intolerable air pollution. Soot and a smell of oil will occur only in case of improper adjustment or perhaps in starting up. In the latter case an inadequate means of ignition, too low carburetor temperature, or excessive cooling of the flame may be the cause. Some methods of combating this difficulty are described here (beginning injection of fuel only after an adequate oil pressure is achieved, in the pressure atomizer burner; as nearly continuous operation as possible for evaporator furnaces; use of higher pressure for the air of combustion). In pressure atomizer burners such difficulties can usually be traced to defective nozzles or to poor combustion from other causes. Installations which give rise to complaints must therefore be overhauled and if necessary replaced. Determination of concerns itself among other things with the following problems: improved mixing of air and oil mists; influence of systems for recirculating smoke gases; ultrasonic and airfoam atomizer burners; electrostatic oil atomizing; total evaporation of the fuel in the vaporizer burner; and speed of combustion.##

04419

R. W. Fiest, F. J. Vlies, and S. Levin

CONTROL OF TOXIC AND EXPLOSIVE HAZARDS IN BUILDINGS ERECTED ON LANDFILLS. Public Health Repts., (U.S.) 81, (5) 419-30, May 1966.

The principal hazard associated with construction on refuse-filled land arises from anaerobic production of combustible gases by methane-producing bacteria. Gas-tight construction over landfills appears to be difficult, if not impossible, because of gas pressures under the structure resulting from biological gas production. During investigations of gas levels in a housing development constructed on sanitary landfills, unsafe methane concentrations were found in a high proportion of the buildings. A concrete slap laid on top of the fill did not prevent gases produced in the fill from penetrating into the

buildings. Several sealants were tested and found inadequate. The results of periodic gas samplings conducted over several years in the sub-basement spaces of a number of buildings indicated that organic fill located around and under heated buildings becomes completely degraded in approximately 5 years, releasing methane at a proportionately rapid rate. This produces a severe explosion hazard unless suitable methods of aerating and venting are employed. Continuous mechanical ventilation at a rate of one or two air changes per hour adequately reduced methane concentrations. (Author summary)##

04460

J. C. Gagliardi

THE EFFECT OF FUEL ANTI-KNOCK COMPOUNDS AND DEPOSITS ON EXHAUST EMISSIONS. 90th Congress ("Air Pollution--1967, Part 3 (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-16, 20-21, 1967, pp. 497-538.) (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper No. 670120.)

The effect of fuel anti-knock compounds and combustion chamber deposits on exhaust hydrocarbon emissions was investigated. Six Ford Galaxies equipped with production non-Thermactor 289-CID, 2V engines were operated on a light-duty driving schedule for periods of 12- 30,000 miles at Ford's Michigan Proving Grounds. Three fuel blends were used in mileage accumulation-Indolene Clear (a full boiling range nonleaded gasoline), Indolene 30 (Indolene Clear plus 3.0 ml/gallon of motor mix blend), and Indolene 30 plus 0.2 theory of an organic phosphorous compound. Two engine lubricants were evaluated for the first 12,000 miles - a petroleum base SAE - 20W - 30 used for Ford factory fill and a synthetic oil, di-2-ethyl hexal sebacate. After 12,000 miles, all test engines were operated on the petroleum based lubricant. Exhaust emissions were monitored at 1,000-mile intervals on the chassis dynamometer using the California Motor Vehicle Pollution Control Board seven-mode procedure. Additional seven-mode cycles were conducted on each engine after combustion chamber deposits were removed at the completion of the mileage accumulation phase. The increase in exhaust hydrocarbon (HC) emissions of the vehicles operating on Indolene 30 and Indolene 30 plus 0.2V phosphorus was substantially higher than the HC increase of vehicles operated on Indolene Clear (an average HC increase of 15 ppm for Indolene Clear versus an average HC increase of 171 ppm for Indolene 30). Operation of nonleaded fuel showed no deleterious effect on intake or exhaust valves or other engine components. (Author abstract)##

04492

E. R. Smith

NUCLEAR POWER AND THE AIR POLLUTION PROBLEM. Preprint. (Presented at the Conference: "Engineering Solutions to Air Resource Problems" Sept. 9, 1966.)

After reviewing the air pollution problem, the role of nuclear power in Southern California and its potential are considered in terms of cost and feasibility. Nuclear power has promise of reducing air pollution in Los Angeles, and has the added advantages of safety and economic savings. In the long run, clean air will require improved control techniques, new sources of power, or perhaps a replacement for gasoline powered vehicles. The scope of these measures - requiring substantial engineering and scientific development - indicates the magnitude of the effort that will be required to "bring back 1940 air to Los Angeles." Nuclear power will undoubtedly help attain that goal.##

04599

R. L. Chass

THE STATUS OF ENGINEERING KNOWLEDGE FOR THE CONTROL OF AIR POLLUTION. Proc. Natl. Conf. Air Pollution, Washington, D. C., 1962. pp. 272-80. 1963.

Control programs are discussed and particular the control program of Los Angeles County, also its demography, urban growth which is paralelled by increase in automobiles. Los Angeles, in spite of stringent air pollution regulations, has continued to increase its industries and to expand existing industries. In spite of the growth pattern, the engineering and enforcement functions of the district have resulted in preventing 6,500 tons of air contaminants from stationary sources, from entering the Los Angeles atmosphere each day. As it is pointed out in this paper, the air pollution problems can be solved, using sound technical and engineering approaches coupled with enlightened administrative and legislative action.##

04621

A. S. Bhullar

REACTION KINETICS IN DIESEL COMBUSTION. J. Inst. Engrs. (India) (Calcutta) 46, (3) 81-4, Nov. 2, 1965.

The combustion process of injected fuel particle is analysed. The reaction kinetics theory has been utilised to obtain a gas phase molecular mixture by allowing the fuel to evaporate in small doses from the combustion chamber in M-combustion system used in Indian army vehicles. In this system, fuel is sprayed onto the walls of a direct combustion chamber, formed on the piston head, in a pencil shaped spray with no attempt for atomization. Most of the spray reaches the spherical combustion chamber walls. A portion of the spray suspended in the air begins to absorb heat, forms a vapor envelope, and commences to burn. The upper layer of fuel on the combustion chamber vaporizes by absorbing heat from the walls of the chamber. Thus, instead of liquid particles, vapor is supplied into the combustion chamber. It is mixed with air by an induction induced swirl. The mixture becomes more or less like a carburetor mixture, i.e., a gas phase molecular mixture, instead of a suspended liquid particles mixture. Thus, a gas phase molecular mixture can be burnt in very high compression ratio Diesel engine. The M-combustion chamber

not only gives better oxygen utilisation, less smoke, less Diesel knock, but comprises a multifuel system which can burn petrol, Diesel or heavy oils.##

04630

Rose, A. H., Jr. and R. Smith

A DIRECT MEASUREMENT TECHNIQUE FOR AUTOMOTIVE EXHAUST EMISSIONS. Arch. Environ. Health 5, (6) 609-15, Dec. 1962. (Presented at the session on constituents of Motor Vehicle Exhaust at the Air Pollution Research Conference, Los Angeles, Calif., Dec. 5, 1961.)

A new sampling approach was developed using direct measurements of the composite exhaust emissions from vehicles moving in actual traffic. Contaminant emissions were expressed at wt. of emission per vehicle mile traveled within the metropolitan areas. The effect of engine power demand on contaminant emissions was also evaluated, since this factor is influenced not only by traffic volume but by average traffic speed, terrain, and operating modes. Emissions were measured under both peak and offpeak traffic conditions for all routes except the neighborhood route. These measurements were made in 8 metropolitan areas chosen to represent different types of geographic areas: Cincinnati, Chicago, Detroit, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D.C. The key to the successful measurement of the exhaust emissions was the proportional sampler. The sampler obtained a composite exhaust sample that is proportional to the exhaust flow under all operating conditions. An electromechanical servo mechanism system controlled the amount of exhaust gas allowed to enter a noncontaminating bag in a fixed proportion to the exhaust flow. The sampling rate was 0.25% of the total exhaust emitted to the atmosphere. Air-fuel ratios also indicate a marked dependence on the effects of the various routes on engine power demand. Mean air-fuel ratio for the downtown routes is 10.0:1; for arterial and residential routes, 12.2:1; for freeways, 13.0:1. This effect on air-fuel ratio is consistent with the effects of engine power demands on hydrocarbon emissions. The effects of olefin production in the exhaust do not show the same degree of correlation as do hydrocarbon emission trends. The conclusions drawn from the limited data thus far are necessarily tentative.##

04661

B. S. Murthy, I. G. Plass

EFFECTIVENESS OF FUEL CETANE NUMBER FOR COMBUSTION CONTROL IN BI-FUEL DIESEL ENGINE. Instn. Engrs. (India), 45(7):155-163, March 1965.

Four fuels covering a broad range of cetane number were carburetted while injecting either a high or low cetane fuel. The carburation rate was about 25% of the total heat input, which was held constant for all tests. Ignition delay, as compared with full load injection only, was reduced with all except the lowest cetane fuel carburetted. Delay decreased with increasing cetane number of the carburetted fuel.

Audible combustion noise was greatly reduced with the carburation of high cetane fuels when the low cetane fuel was injected. With high cetane fuel injection, the entire combustion noise level was lower. Further reductions were not evident when either high or low cetane fuel was carburetted. Concurrent carburetion of fuel improved the full load thermal efficiency up to a certain cetane number range. At a carburation rate of 12% of total heat input, methanol did not fire at the compression ratio for standard ignition delay of high cetane injected fuel. The ignition delay with methanol at the higher compression ratio used when injecting the low cetane fuel was longer than with any of the other fuels tested. Audible combustion noise, peak cylinder pressure and rate of pressure rise increased with the increasing rate of propane carburation. When low cetane fuel was injected, exhaust temperature was slightly lower and smoke density slightly higher with methanol carburation. With the injection of higher cetane fuel, the exhaust temperature was lower with carburation of all fuels compared with full load injection only. Exhaust smoke density was reduced with carburation of high cetane fuels, but was increased slightly with methanol carburation. This small effect of dual-fuel operation on exhaust smoke does not agree with large smoke reductions reported by other workers. The difference may be due to the fuels used, percentage of total heat input carburetted, combustion chamber design of the engines used and/or methods of measuring smoke density.##

04731

H. Alperstein and H. L. Bradow

INVESTIGATIONS INTO THE COMPOSITION OF END GASES FROM OTTO CYCLE ENGINES. S.A.E. (Soc. Automotive Engrs.) Preprint. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Detroit, Mich., June 6-10, 1960.)

Techniques are described for determining the chemical nature of the end gas in a normally fired CFR Otto cycle engine. Apparatus for obtaining and chromatographically analyzing representative end-gas samples is described, and its utility illustrated using isooctane as a fuel. Twenty-seven carbon containing slow combustion products were identified before flame arrival; these consist principally of olefins, ring ethers, carbonyls, CO, and CO_2. Product formation is shown to increase with increasing pressure and temperature stress and to be inhibited by octane number appreciating additives. Distinct product formation trends from the slow combustion of isooctane were observed. (Author abstract)##

04792

H. E. George and H. A. Durlin

AIR POLLUTION FROM COMMERCIAL JET AIRCRAFT IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. (Apr. 1960). 67 pp.

An investigation of commercial jet aircraft operations at Los Angeles International Airport to determine the daily emission of atmospheric air contaminants was made. Smoke emissions and other air contaminants are byproducts from the combustion of fuel used in the turbojet engines. The jet exhaust was tested for particulate matter, aldehydes, oxides of nitrogen, hydrocarbons, carbon monoxide, carbon dioxide and oxygen. Evaluation of the data suggest that the total contaminant emissions from jet aircraft operations are insufficient to produce any generalized deterioration of air quality. Visible smoke emission from commercial jet aircraft do occur during take off and landing but on take-off the emission of smoke in excess of legally allowable opacity limits is well within the allowable three minute time limit and on landing the smoke emissions do not exceed the opacity limits.##

08808

J. H. Ludwig

THE VEHICLE POLLUTION PROBLEM. Preprint. (Presented at the American Public Power Association Conference, Denver, Colo., May 8-11, 1967.

The problem of emissions from motor vehicles is reviewed from the standpoints of the contribution of vehicles to community air pollution; present programs in control regulations and application of devices, and the immediate and longer-term outlook for additional controls. (Author abstract)##

08922

W. F. Dester and R. G. Jewell

FACTORS AFFECTING CARBURETOR VAPOR LOSSES. Am. Petroleum Institute, Preprint. (Presented at a Session on Automobiles, Hydrocarbons, and Clean Air, 25th midyear Meeting, American Petroleum Inst. Division of Refining, Detroit, Mich., May 11, 1960.)

Gasoline vapor, escaping from carburetors of motor vehicles during operation, has been considered as a source of air pollution. During a study made to establish the magnitude of this loss the various contributing factors were investigated. Carburetor vapor loss is affected by: 1, the temperature of the carburetor bowl; 2, the volatility of the fuel; 3, the manner in which the vehicle is operated (driving pattern); and, 4, the carburetor vent design. Carburetors can be divided into two classifications depending upon their venting: 1, those with restricted internal venting capacity (e.g., a single 1/16-in. diameter vent) from which large vapor losses may occur; and, 2, those with adequate internal venting capacity from which vapor losses will be small or nil. Carburetors in the second category include those which have no external vents, and externally vented models equipped with either multiple internal vents or a single internal vent of approximately 1/8 in. diameter. Bench unit data indicated that vapor loss is a function of carburetor bowl temperature, but tests with three different vehicles using and 8-lb Rvp (Reid vapor pressure) fuel indicated that such a relationship only exists for specific driving patterns, such as low-speed cruising and extended periods

of idle. Under these conditions carburetor bowl temperatures may rise by as much as 40 F to 80 F above the ambient, as a result of pickup of engine heat by the fuel. Limited testing indicated that carburetor vapor loss is also a function of fuel vapor pressure, but analyses of the recovered vapors (70 percent of C5+) suggested that fuel composition and front-end volatility were also important factors. The driving pattern affects carburetor vapor loss by influencing the pressure differential across the external vent. At low cruising speeds and during extended periods of idle, a positive pressure differential may exist and losses occur. At higher cruising speeds, the pressure differential tends to become negative, thereby preventing losses. A survey of the California car population (as of July 1957) indicated that approximately 20 per cent of the vehicles were equipped with carburetors from which substantial vapor loss could occur. (Author abstract)##

04991

J. G. Payne H. W. Siguorth

THE COMPOSITION AND NATURE OF BLOWBY AND EXHAUST GASES FROM PASSENGER CAR ENGINES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952 pp. 62-70

The purpose was to present results of work wherein over-all rates and composition of blowby and exhaust from the engines of three passenger cars were studied as a function of operating conditions. Particular emphasis was placed on the so-called noxious products in exhaust and blowby. The tests were carried out on a chassis dynamometer where actual road conditions could be duplicated in an automobile operating on a stationary test bed. Analyses were made using a mass spectrometer Blowby and exhaust rates increase with increasing power output. Engine mechanical condition has little effect on exhaust rates, but poor mechanical condition can cause a greater than tenfold increase in the rate of blowby under some conditions. Materials such as CO, CO_2, H_2O, H_2, O_2, and N_2, were found to comprise over 99 percent of the composition of both exhaust and blowby. The remaining less than one percent contains the noxious materials. Except under decelerating conditions exhaust gases contain a lower proportion of noxious products than blowby gases and no materials of mass greater than 58. Common conditions of engine malfunctioning such as misfiring and retarded timing can increase the concentration of noxious products in the exhaust. The concentration of noxious products in blowby was affected by fuel type, carburetor adjustment, and power output. The following classes of compounds were identified as present or probably present in blowby: Paraffins, olefins, aromatics, cyclics, acids, alcohols, aldehydes, and an organic hydroperoxide. No material of mass number higher than 86 was found in greater than trace quantities.##

04999

F. L. Magill, O. H. Hutchison, J. B. Stevens

HYDROCARBON CONSTITUENTS OF AUTOMOBILE EXHAUST GASES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 71-83.

The aim was to present the results of mass spectrometer analyses of hydrocarbons exhausted by passenger car exhausts. The ultimate objective was to arrive at an estimate of the amount of hydrocarbons released into the Los Angeles atmosphere by gasoline-burning vehicles. The exhaust gases of automobile passenger cars were analyzed for C1 to C7 ; hydrocarbon content passenger cars were analyzed for bhc1 to C7 ; hydrocarbon content with the mass spectrometer. The hydrocarbons found include methane, acetylene, paraffins, and olefins from bhc2 to C7+. The exhaust composition was found to be independent of the type of gasoline burned, using gasolines ranging from premium gasoline of current-day producers to saturated straight-run gasoline typical of prewar production. New cars and old cars showed relatively little difference in exhaust composition during acceleration and steady driving. Under conditions of idling and deceleration, the hydrocarbon content exhausted from prewar cars was approximately twice that of postwar cars. Over the range of driving conditions encountered in city traffic, there is a loss of hydrocarbon out of the exhaust ranging from 5 percent of the weight of fuel entering the carburetor under conditions of steady driving to 19 percent during periods of deceleration. The total quantity of C1 to C7+ hydrocarbons released by automobile exhausts to the atmosphere over Los Angeles County during a twenty-four-hour day is estimated to be about 650 tons.##

04995

R. L. Hall

PRODUCTS OF COMBUSTION OF GASEOUS FUELS. Proc Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 80-9.

Data on the combustion products of fuel gases is reviewed. Work on the photochemistry of smog is related to work on vapor phase gas produced in manufactured gas by hydrocarbons and NO2 catalytically oxidized from NO in the presence of butadiene.##

05005

R. P. Hangebrauck, D. J. von Lehaden, and J. E. Meeker

SOURCES OF POLYNUCLEAR HYDROCARBONS IN THE ATMOSPHERE. Public Health Service, Cincinnati, Ohio. National Center for Air Pollution Control. (PHS Publ. No. 999-AP-33.) 1967. 98 pp.

Rates of emissions of polynuclear hydrocarbons were measured at several sources considered likely to produce such emissions. The sources included heat generation by combustion of coal, oil, and gas; refuse burning; industrial processes; and motor vehicles. The annual emissions of benzo(a)pyrene in the United States were estimated for each of the sources surveyed, to provide a rough gauge of the importance of each source. Small, inefficient residential coal-fired furnaces appear to be a prime source of polynuclear hydrocarbons; other sources may be of local importance. Production of polynuclear hydrocarbons was generally associated with conditions of incomplete combustion. (Author Abstract)##

05007

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint. 1967. 54 pp.

The various facets of the vehicle pollution problem from the standpoint of both effects on community atmospheres nationwide and the source of variables are summarized. The problems that remain today encompass a number of considerations, which may be enumerated as follows: (1) The importance of the diesel problem as it relates to smoke and odor control, the means for securing reduction of smoke and odors, and the development of test procedures for the setting of standards; (2) The importance of relative reactivity of the various organic species, particularly hydrocarbons, and the effects of reactivity on both standards and control methods; (3) The importance of various emission sources (exhaust, crankcase ventilation, fuel tank evaporation and carburetor evaporation losses) in relation to reactivity and need for control and the development of test procedures for these sources from all types of vehicles (passenger cars, trucks and buses); (4) The need for control of nitrogen oxides from vehicular sources, both gasoline engine and diesel engine power sources and concurrently for stationary sources; (5) The importance of instrumentation in measurement of pollution parameters for research, enforcement (certification) procedures, surveillance and inspection; (6) The problems of maintenance of devices on vehicles to insure their continued operation (surveillance and inspection), and/or the upgrading of such devices such that they will be essentially maintenance free; and (8) The importance of in-traffic carbon monoxide levels, particularly their significance relative to driver fatigue.##

05011

A. A. Orning, C. H. Schwartz, and J. F. Smith

MINOR PRODUCTS OF COMBUSTION IN LARGE COAL-FIRED STEAM GENERATORS . American Society Mechanical Engineers New York Paper 64-WA/FU-2.
(Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, New York City, Nov. 29-Dec. 4, 1964)

An analysis is given of the minor products of combustion from large coal-fired steam generators in relation to thermodynamic equilibria, unit design and operating conditions. Concentrations of nitrogen oxides and the ratios of sulfur trioxide to total sulfur oxides are near equilibrium values at the furnace outlet. Significant amounts of low molecular weight organic acids and comparatively small amounts of polynuclear aromatic hydrocarbons are found under good combustion conditions. (Author abstract)##

05012

A. A. Orning, C. H. Schwartz, and J. F. Smith

A STUDY OF THE MINOR PRODUCTS OF COAL COMBUSTION. American Society Mechanical Engineers, New York. Paper 64-PWR-4.

(Presented at the IEEE-ASME National Power Conference, Tulsa, Okla., Sept. 27-Oct. 1, 1959.)

A study of the minor products of combustion from large coal-fired steam generators is described. Concentrations were determined for sulfur oxides, nitrogen oxides, various organic materials including organic acids and polynuclear aromatic compounds, and particulate matter with spectrographic analyses for various metals. Analyses of the data in relation to thermodynamic equilibria, operating conditions, and unit design are in progress. Some of the more obvious conclusions are given. Purpose of the paper is to describe the testing plan and the difficulties involved, and their importance in relation to extension of such studies to include oil and gas-fired units. (Author abstract)##

05067

S. T. Cuffe, R. W. Gerstle, A. A. Orning, and C. H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS; REPORT NO. 1. J. Air Pollution Control Assoc. 10, (3) 251-67, Sept. 1960 (Presented at the 53th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Air pollutant emissions from two types of coal burning power plant furnaces were studied. Particulates entering the fly-ash collector from the low-intensity-sizing, vertically fired boiler of Unit A accounted for 80% of the ash contained in the coal charge. In the high-intensity-sizing, horizontally fired Unit B, 85% of the total ash entering the boiler in the coal was carried to the fly-ash collector. The fly-ash collectors effectively removed 85 to 95% of the particulate matter and showed essentially the same efficiency in removal of common trace metal compounds. Concentrations of sulfur trioxide ahead of the dust collector varied widely. For Unit A, the vertically fired boiler, they averaged about 4% of the SO2 concentration; for Unit B, the horizontally fired boiler, formation of SO3 was lower, averaging less than one percent of the SO2 concentration. The fly-ash collectors effected an appreciable reduction in sulfur trioxide emissions on Unit A but not on Unit B. For both units SO3 emissions were less than one percent of their SO2 emissions. Nitrogen oxide concentrations during normal full-load operation were increased 30 to 60% by passage through an electrical precipitator. Organic acid concentrations were appreciably higher than those of gaseous hydrocarbons, formaldehyde, and carbon monoxide. The very small concentrations of gaseous hydrocarbons, formaldehyde, and carbon monoxide indicated very complete and efficient combustion during both full-load and partial-load operation. Emissions of polynuclear hydrocarbons from large power plant boilers were found to be very small in comparison with those from smaller coal-fired units having less efficient combustion processes.##

05097

R. F. Haagen

A COMPARISON BETWEEN THE HYDROCARBONS IN AUTOMOBILE EXHAUST AND THOSE FOUND IN THE LOS ANGELES ATMOSPHERE. Preprint.

(Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961.)

Ambient air samples obtained from the central Los Angeles business district were analyzed by gas chromatography. Hydrocarbons in the C2-C7 molecular weight range were identified and their concentrations determined. The results obtained from these analyses are compared to those obtained from diluted automobile exhaust and diluted automobile exhaust that had been irradiated for a period of four hours. Gas chromatography was found to be an accurate reproducible procedure for the analysis fo C2 to C7 hydrocarbons present in the atmosphere. The procedure is limited by the inability to determine the methane concentration as well as the C8 hydrocarbons. In the sixteen samples analyzed, it was found that the relative concentrations of the individual hydrocarbon groups did not change significantly with total concentration. This would indicate that the hydrocarbon emissions to the atmosphere are relatively constant. A linear relationship was also found to exist between total hydrocarbons recovered and the sum of the nitric oxide + nitrogen dioxide levels. Comparison of atmospheric hydrocarbons to those produced by automobile exhaust indicates that natural gas could be a major source of the low boiling hydrocarbons present in the atmosphere. The relatively low acetylenic level found in the ambient air samples, as compared to diluted automobile exhaust, also indicate significant contributions are made by automobile blowby emissions as well as carburetor and fuel tank evaporation losses.##

05106

G. W. Piero

PROTECTIVE COATINGS AND RULE 66. Am. Paint J. 52 (29), 70-1, 74, 76, 78, 80, 82 (Jan. 9, 1967).

Rule 66 defines "photochemically reactive" solvents as those containing more than 20 per cent total of the substances listed or more than: (1) 5 percent olefinic or cyclo-olefinic hydrocarbons, alcohols, aldehydes, esters, ethers or ketones, (2) 8 percent C8 or higher aromatics except ethylbenzene, (3) 20 per cent ethylbenzene, toluene, branched ketones or trichloroethylene. Rule 66 requires reduction of 85 per cent of emissions of solvents from various industrial applications if "photochemically reactive" solvents are used. There are some uncertainties with regard to the rule. For example, both state and federal protective coatings specifications in many cases specify the solvents employed and often they are the "photoreactive" variety. To make matters worse, Presidential Orders require Federal facilities to abide by local air pollution regulations. After many consultations with industry, in March and April 1966 LA APCD, in conjunction with California Manufacturers Assn., conducted a series of tests on solvents and Rule 66 was finalized. The reason for this rule was that an estimated 345 tons of solvents were emitted each day in 1965 from the drying of protective coatings. After the final Rule 66 was adopted, the Bay Area APCD followed suit and in its current draft it prohibits the sale or use of quart or larger sizes of building coatings containing more than 8 per cent "reactive organic compounds" plus 12 per cent of monosubstituted aromatics.

industrial coatings are limited to 20 per cent of "reactive organic compounds." Thus, in the current draft, Bay Area APCD regulations are somewhat less restrictive than LA APCD Rule 66, but the number of pounds exempt per facility is less than LA. The Bay Area APCD estimates 1964 emission of solvents to be 497 T/D of solvents. Industry is compiling data for a more up-to-date figure. It should be borne in mind that this is a draft; final Regulation 1 is expected to issue in January of 1967 to become effective January 1, 1968.##

05109

N. L. Falk, P. Kotin, and A. Miller

AROMATIC POLYCYCLIC HYDROCARBONS IN POLLUTED AIR AS INDICATORS OF CARCINOGENIC HAZARDS. Intern. J. Air Pollution 2, 201-9 (1960). (Presented at the Air Pollution Symposium, 136th National Meeting, American Chemical Society, Atlantic City, N.J., Sept. 17, 1959.)

The concentration of 3,4-benzpyrene in air samples has been used as an indicator of carcinogenic risks in breathing polluted air, and rapid and reliable methods for the determination of benzpyrene have been worked out. This approach has two shortcomings. First, polluted air frequently contains carcinogens other than polycyclic aromatic hydrocarbons. Second, there is no accounting for other effects of polluted air. These effects may enhance the carcinogenic process by inhibiting the normal physiologic process by which foreign materials are eliminated from the lung. The conditions under which quantitation of 3,4-benzpyrene in air samples is carried out in the laboratory may be far different from those existing in the lung. The liberation of benzpyrene from rubber tire dust by an aqueous protein solution, as is encountered in the lung, occurs rapidly. In the case of soots, particle size plays an important role in determining whether elution of polycyclic aromatic hydrocarbons will take place. The smaller particles that retain their hydrocarbons may also adsorb additional hydrocarbons that have been eluted from larger size particles in the immediate neighborhood. Competitive effects have been observed between aromatic polycyclic hydrocarbons as found on soot and dust with regard to the production of tumors. As there is marked structural similarity between cancer-producing and inactive compounds, the intracellular site of action may be common for both groups and the latter may thus inhibit the action of the former in producing cancer. A chemical method for the evaluation of the carcinogenic potency of polluted air requires determination of all polycyclic aromatic hydrocarbons elutable by protein solutions. There are still a number of unidentified hydrocarbons present. The stability of these compounds adsorbed on soot when exposed to the atmosphere differs from one compound to the next.##

05111

N. A. Renzetti

ANALYSIS OF AIR NEAR HEAVY TRAFFIC ARTERIES. Air Pollution Found. Los Angeles Sept. 16, Dec. 1956. 10 pp.

The primary objective of this work was to obtain the range of concentration of the principal constituents of automobile

exhaust in the vicinity of heavy traffic. Samples were taken at essentially ground level (five feet) within 60 to 75 feet of the traffic artery and analyzed for carbon monoxide, hydrocarbons, and carbon dioxide by infrared spectrometry. The carbon monoxide values ranged from 4 to 91 ppm (by vol.); the hydrocarbons, from 0.25 to 2.3 ppm (by vol, as hexane); and carbon dioxide, from 0.05 to 0.19 per cent (by vol.). Samples were taken from 6 a.m. to 9 a.m., local time, on week days of the period from September 4 to October 2, 1956. This period was characterized by low inversions, low winds, and high solar radiation, and on a large number of the days high oxidant values and eye irritation were experienced. Meteorological data and atmospheric oxidant and eye irritation values for these days are tabulated at the end of the report. (Author summary)**

05133

Wagner, J.; R. P. Hangebrauck, and A. J. Schwartz

EFFECTS OF AIR-FUEL STOICHIOMETRY ON AIR POLLUTANT EMISSIONS FROM AN OIL-FIRED TEST FURNACE. J. Air Pollution Control Assoc., 10(5):312-317, May 1960. 19 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, June 11-16, 1967, Paper No. 67-124.)

An experimental, domestic-sized, oil fired test furnace to be used for evaluation of fuel additives and combustion process modifications in reducing air pollutant emissions is described. Operating data and emissions of particulate matter, smoke, carbon monoxide, gaseous hydrocarbons, oxides of nitrogen, and oxides of sulfur are reported over the range of operable air-fuel ratio. Emission levels are interpreted in terms of key operating parameters and potential areas for reduction of emission. (Authors' abstract modified)**

05191

F. G. Sounds, P. A. Bennett, and G. J. Nebel

SOME EFFECTS OF ENGINE-FUEL VARIABLES ON EXHAUST GAS HYDROCARBON CONTENT. J. Air Pollution Control Assoc. 5 (2), 109-19 (Aug. 1955) and Trans. SAE (Am. Soc. Mech. Engrs.) 63, 591-601 (1955). (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1955.)

The aim was to obtain a better understanding of the factors influencing the concentration of hydrocarbons in engine exhaust. Initially, tests were made to determine the fraction of the total fuel supplied to the engine which appeared as hydrocarbons in the exhaust at different driving conditions. Later, more exhaustive tests were made to determine the effect of common engine-fuel variables at each driving condition. The data are based on mass spectrometer and/or Orsat analyses of exhaust gas samples obtained from 151 passenger cars and 8 public transit buses. Reductions in exhaust gas hydrocarbon content can be achieved through proper maintenance and design. Mass spectrometer analyses have indicated that the hydrocarbon content of engine exhaust gas varies appreciably with driving condition. The most important engine-

fuel variable affecting the hydrocarbon content at idle was mixture ratio with the highest hydrocarbon contents being observed at rich mixtures. A substantial reduction in the average hydrocarbon content could be obtained by adjustment of the idle mixture ratio of all cars to the range resulting in best idle operation. The current trend toward the overhead valve V-8 engine should also help to reduce idle hydrocarbon losses since these engines will idle acceptably with leaner mixtures than either 6 cylinder or line 8 engines. Fuel type was found to have essentially no effect on the exhaust gas hydrocarbon content. None of the engine-fuel variables investigated at part throttle were observed to affect significantly the hydrocarbon content. These included mixture ratio, compression ratio, fuel type, coolant temperature, engine type, engine speed, and engine load. The most important engine-fuel variable affecting the hydrocarbon content during simulated deceleration was manifold vacuum. The hydrocarbon content was found to increase sharply to high values at manifold vacuums above 21 inches of mercury. Since manifold vacuum during a closed throttle deceleration depends upon engine speed, the trend toward automatic transmissions and lower rear axle ratios made possible by higher output engines tends to reduce hydrocarbon losses by reducing engine speed at a given car speed. Limited studies using gasoline, LPG, and Diesel powered public transit buses have suggested that there is no significant difference in the total amount of hydrocarbon released to the atmosphere by the three different engines provided that the overall fuel consumptions is comparable.##

05184

V. N. Trofilov, and N. D. Shanavi

HYGIENIC CHARACTERIZATION OF LABOR CONDITIONS IN THE CHLOROPHOS INDUSTRY. Gigiyena Truda i Professional' Bolezney, Translated from Russian, 61-3, 1963. Russ. (Tr.)

Analysis established the atmosphere of the chlorophos production department to be contaminated mostly by chloral, dimethylphosphate and chlorophos vapours. Judging by the available clinical data the detected concentrations of organophosphorus compound (chlorophos and dimethylphosphite) vapours reached dangerous levels, which, as it was noted, gave rise to the development of intoxications. In reconstruction and erecting new analogous plants it is recommended that particular attention be attached to proper sealing of equipment and to elimination of manual operations. It is also suggested to make provisions for automatic pouring of chlorophos, its measuring, weighing and washing of barrels to be effected in special shielded chambers. (Author summary)##

05292

J. A. Chandler

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES. Proc., Am. Petrol. Inst., Sect. III 38, 124-35 (1958). (Presented before a session on air pollution, 23rd Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif., May 15, 1958.)

The factors affecting hydrocarbon concentration in exhaust gas to the greatest extent are manifold vacuum, engine detuning (maladjustment and/or poor mechanical condition), and cold as compared to hot engine starting. Manifold vacuum of more than approximately 21.5-in. Hg (mercury) accounts for high concentrations of hydrocarbons during deceleration. This effect is accentuated by high speeds at the start of deceleration and by manual transmissions as compared to automatic transmissions. Accelerating and cruising conditions at various engine speeds produce similar hydrocarbon concentrations, generally in the range of 1 per cent to 5 per cent of the supplied fuel, with hydrocarbon concentrations tending to decrease with increasing engine speed. Enriched carburetor idle setting increase hydrocarbon emission during cruise up to approximately 10 mph. One misfiring plug may more than double the average hydrocarbon concentration. A deposit-fouled spark-plug set can increase the rate of hydrocarbon emission more than 2 1/2 times during a wide-open-throttle acceleration. Among variables which affect oxides of nitrogen, air-fuel ratio is of primary importance. Lean mixtures promote the formations of oxides of nitrogen and increase the relative effects of other engine variables. Under full throttle, rich mixture conditions, concentrations of oxides of nitrogen are relatively low. Under part-throttle conditions, however, mixtures are sufficiently lean to persit varying degrees of importance to be attached to ignition timing advance, manifold pressure increase, and compression ratio increase, all of which promote oxides of nitrogen formation. Under road-load cruise conditions and during full-throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations, there is no general effect of speed, and high concentrations may be exhausted even at low speeds. During idling and deceleration, oxides of nitrogen concentrations are so low as to be considered insignificant.##

05312

Chironis, N. P.

SMOG: THE DEADLY POISONS PERIL LIFE IN ALL CITY AREAS. Prod. Eng. 37, 33-41 (Dec. 19, 1966).

The air pollution problem is national in scope. Pollution-control officers continue to make a point of cracking down on offending factories, power stations, and incinerators. But, behind the scenes, the case against automotive contaminants is building up, and nothing less than a revolution in automotive engineering will satisfy tomorrow's standards. This design revolution is chartered for three stages: Modification of existing engines--improved carburetors, timing systems, cylinder-head design--and the addition of devices to burn off hydrocarbons and noxious gases. A search for new types of internal combustion engine--fuel injection engines, improved gas turbines, rotary engines. Entirely new propulsion systems that don't use fossil fuels--electric cars with batteries or fuel cells, linear motors for mass transportation systems, perhaps nuclear power either indirectly to charge batteries or directly to drive vehicles. It was indicated that pollutants from all sources amount to 115 million tons a year. So motor vehicles account for about 60 percent of the nation's atmospheric wastes, by weight. Moreover, government figures indicate that vehicles are responsible for about 97 percent of the misfin hydrocarbons and 40 percent to 60 percent of the nitrogen

oxides. Controls are aimed at three specific targets: emissions from the tailpipe, from crankcase ventilations, and from carburetor and gas tank evaporation. The tailpipe is by far the greatest source of emissions, accounting for up to 65 percent of the hydrocarbons and almost all the carbon monoxide and nitrogen oxides. But the crankcase emission is the easiest to control, and California chose it as the first target six years ago. These allow 275 ppm of hydrocarbons and 1.5 percent carbon monoxide by volume. Effective Jan. 1, 1970, however, California will cut these allowables to 180 ppm hydrocarbons and 1 percent CO. The state is also considering a proposal to adopt a standard of 350 ppm of nitrogen dioxide.

05321

Jackson, Marvin W.

EFFECTS OF SOME ENGINE VARIABLES AND CONTROL SYSTEMS ON COMPOSITION AND REACTIVITY OF EXHAUST HYDROCARBONS. In: Vehicle Emissions, Part II. SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N. Y., 1968, p. N. Y., 1968, p. 241-267. ((41)) refs. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Detroit, Mich., June 3-10, 1966.)

The effects of air-fuel ratio, spark timing, an engine modification system, and the Air Injection Reactor System on the composition and reactivity of the exhaust hydrocarbons are reported. The reactivity index and composition changes are compared to those indicated by the nondispersive infrared analyser. Either retarding the spark timing or leaning the air-fuel ratio reduced the hydrocarbon concentration measured by the infrared analyser. In contrast, the reactivity index increased as the spark timing was retarded and the decrease in the reactivity index due to leaning the air-fuel ratio was only 1/2 the decrease in the concentration measured by the infrared analyser. For equal reductions in the concentration measured by the infrared analyser, the reactivity index with the engine modification system was 37% higher than that with the Air Injection Reactor System. Conversely, in order to produce an exhaust with the same level of reactivity, the engine modification system has to reduce the concentration measured by the infrared analyser about 70 ppm n-hexane more than the Air Injection Reactor System. The use of the reactivity index points out significant differences in smog-forming potential resulting from both changes in engine design variables and exhaust control systems; these differences are not revealed by measurements made using the infrared analyser. (Author's abstract) 88

05337

G. G. Esposito

IDENTIFICATION OF AEROSOL PROPELLANTS IN PAINT PRODUCTS BY GAS-LIQUID CHROMATOGRAPHY (FINAL REPT.) Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (Rept. No. 226.) Mar. 1967. 15 pp.

Aerosol packaged paint products have gained widespread acceptance in recent years. Because of safety and toxicity factors, the type of propellant employed is of vital importance. This report describes a rapid, specific procedure for the identification of propellants using gas-liquid chromatography. A chilled can of paint is sprayed into a test tube and the atmosphere above the liquid is sampled. The analysis is conducted on silicone grease and porous polymer columns. (Author abstract)##

05911

E. E. Starkman

VARIOUS COMPONENT GASES OF ENGINE GENERATED POLLUTION POSE DIFFERING HEALTH HAZARDS. S.A.E. (Soc. Automot. Engrs.) J. 75, (3) 85-7, Mar. 1967

Unburned hydrocarbons, oxides of nitrogen, carbon monoxide, and carcinogens are among the emissions generated by engines. Each produces hazards of varying importance and each presents a different control problem. For example, the ultimate method of reducing the hydrocarbon emissions is to supply a completely stratified charge. As with the hydrocarbons, many engine variables influence the concentration of nitric oxide. Carbon monoxide concentration follows directly the fuel-air ratio, and a rich mixture operation must be avoided at all times. Reduction in carcinogen content should occur as the concentration of unburned hydrocarbons is reduced.##

05977

R. Gasiorowski

(ENERGY GENERATION FROM LIQUID FUELS.) Energieerzeugung aus flussigen Brennstoffen. Gesundh. Ingr. (Munich) 86 (9), 116-22 (Apr. 1965.) Ger.

Air pollution due to oil-fired installations is caused by sulfur dioxide, carbon dioxide, nitrogen oxides, and products of incomplete combustion (carbon monoxide, hydrocarbons, ashes, and soot). Percentual share of these agents in flue gases produced from different fuel oils under various combustion conditions is given. Efficiency of high smoke stacks in dispersing SO2 is discussed and presented graphically. Statistical data are presented on share of automobile engines, domestic furnaces, and industrial furnaces in cities' air pollution due to SO2.##

05979

A. Goetz

AEROSOL FORMATION IN NATURAL AND POLLUTED AIR. (Aerosolbildung in natürlichen und verunreinigten Luftmassen.)

Preprint. Ger. Pr. (Presented at the Internationales Emissionsschutz Forum, Essen, Germany, 1966.)

The nature, type, and the effects resulting from modifications by aerosols of reactive gaseous constituents contained in the biosphere are reviewed. Aerosols modify the physical as well as the chemical reaction pattern of the molecular-disperse gaseous phase to a considerable degree in spite of the fact that the total mass of this colloid substance is minimal 10 to the minus 7th to 10 to the minus 8th compared to that of the gases which suspend the colloids. The increase in concentration of aerocolloids becomes obvious through a rapidly increasing visibility restriction due to contrast reduction by light scattering should also be considered. The growth of aerosols demonstrates the presence of reactive emission components by increased haze formation. It also has to be realized that the origin of the haze production is not necessarily tied to the locality of the pollution source because such reactions proceed relatively slowly, especially when different reaction partners originate at different localities or when a high particulate level is already present due to climate conditions. The formation of aerocolloids is by far not restricted to industrial and other man-made pollutions but results also from many processes in nature which go on continuously over the earth's surface in large variety. Consequently the final effect of emissions depends to a large extent on the geographical and climatic conditions and the natural aerosol levels, so that knowledge about their origin and formation rate is necessary to judge the final effect of various emission types over specific population areas. The sources, chemical and physical interactions , and methods for determining the size distribution of aerosols are considered.##

05598

U. J. Bonke, D. J. Lindley, and C. H. Sechrist

HOW TO STUDY EFFECT OF BLOWBY GAS. Hydrocarbon Process. 45 (9), 301-6 (Sept. 1966).

A new technique for the study of blowby gas uses an engine which contains Teflon parts and thus can operate without lubricating oil. This allows the generation and collection of uncontaminated gas samples for studying vehicle emissions, engine sludge and deposit formation. The character and chemical composition of blowby gases were explored by ducting them from the engine and fractionating them in a series of traps at 32, minus 100, and minus 320F. Each fraction was analyzed by (1) infrared absorption, (2) mass spectrometry, and (3) gas chromatography. Changing air-fuel ratio had little or no effect on the composition of the hydrocarbons being emitted from the crankcase. The hydrocarbon portion of the blowby gas was roughly 50% aromatics, 35% saturates, and 15% olefins. The composition of the hydrocarbon portion was approximately the same whether the fuel was a full range boiling range gasoline or isooctane. The appearance of a broad spectrum of paraffinic hydrocarbons, olefins, and aromatics when using isooctane fuel is evidence of extensive chemical reactions taking place within the combustion chamber of an engine. The

combined concentration of oxygenated organic compounds present in the blowby gas, collected in our studies, was less than five parts per million. This includes all oxys to C12. Only the simplest of these oxygenated compounds, formaldehyde, acetaldehyde, methanol, and ethanol, were identified. The blowby gas from the operating engine was bubbled through oil samples maintained at 275F. As a control, air at the same rate was passed through another sample of the same oil, maintained at the same temperature. Analyses showed that the rate of oxy compound generation in the oil contacted by blowby gas was 10 times greater than that in the oil contacted by air. Details of engine modification, operating conditions and gas evaluation are presented.##

056 12

T. W. Legatski

THE ENGINE BEHAVIOR CHARACTERISTICS OF L.P.-GAS FUELS. Preprint. (1959).

The purpose was to offer a further analysis of the findings of a research program on engine requirements under severe operating conditions and on fuel behavior characteristics as related to fuel composition. Eight two-component and two three-component LP-Gas blends were tested in one or more of four 1958 model LP-Gas truck engines of different makes or models. The permissible knock-limited spark advance was determined throughout the speed range. Neither ASTM Motor or ASTM Research octane numbers, as calculated from a knowledge of fuel composition, nor any combination of them reflects fuel behavior in the more severe types of current LP-Gas engines. Behavior of LP-Gas fuel formulations in severe engines and under severe service conditions can be predicted from fuel composition using a new and different scale of values which has been designated as the ESSO scale. Since the ESSO (service octane scale) numbers are only significant when related to an engine of assigned high severity, the numbers lack utility as an overall quality yardstick. Both propane and propylene are depreciated by about the same amount in current severe types of LP-Gas engines. Behavior of LP-Gas fuels in the more common mild engines, operated under mild conditions, can be predicted from fuel composition and some scale of antiknock values lying in between those of the ASTM-Research and ASTM-Motor methods of test.##

056 11

London, A. L.

THE APPLICATION OF RESEARCH TO MOTOR VEHICLE EMISSION CONTROL--CAN WE AVOID AFTERBURNERS? (Presented at a Session of the Air Pollution Research Conference on "The Application of Research to Motor Vehicle Emission Control," Los Angeles, Calif., Dec. 7, 1961.)

Basic improvements in the design, production control, and maintenance of the carburetor and distribution system of the conventional spark-ignition four-stroke cycle automobile engine, and a change of engine type to one having inherently the potential for low hydrocarbon emissions are reviewed. Chemical considerations, especially fuel-air ratio, are discussed. Engine test results are considered. The low pollution potential of the following possible alternate automotive power plants is discussed: diesel engines, gas turbine engines, and stratified charge engines. The cost factor is mentioned.

05648

J. H. Elliott, H. Rayne, and R. F. LeBuc

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 7). Los Angeles County Air Pollution Control District, Calif. Jan. 1961. 26 pp.

The progress made on the experimental program for the control of solvent emissions from surface coating operations is reported. The results of 16 runs made with two industrial finishes, an air dry lacquer and a high temperature baking enamel, are discussed with respect to particulate matter removal before the air stream enters the carbon unit. Various filters and combinations of filters were used in this study. Additional runs were made using single and mixed solvents with the four-tray adsorber. The results are analyzed with respect to the effect of using saturated versus superheated steam on the retentivity of the carbon for these solvents. Carbon life, pressure drop, and temperature rise for the four-tray absorber are also discussed. The status of the program, together with the questions that have been answered, and the questions to be answered, are delineated. A modification of the first conical unit adsorber is described. The experimental work on this modified unit, now under construction, will conclude the work on the spray booth phase of this project.##

05649

Smith, I. B.

NITROGEN TETROXIDE DISPOSAL UNIT COMBUSTION PRODUCTS. National Aeronautics and Space Administration, Las Cruces, N. Mex.; Manned Spacecraft Center. May 1967. 7pp. (Rept. No. NASA TN D-3965.)

A test program was conducted to determine the identity of the combustion products released to the atmosphere by the vapor disposal units which dispose of nitrogen tetroxide by burning with propane. The burner unit, which is designed to dispose of at least 10 lb of nitrogen tetroxide per minute, consists of an injector system for the propane and the nitrogen tetroxide, a mixing chamber, a burner head constructed to minimize flashback, and a spark-plug igniter system controlled from a blockhouse. Samples of the combustion products were collected and analyzed by infrared

spectroscopy. When the unit was operated in the normal, slightly fuel-rich mode, the detectable combustion products were carbon dioxide, water vapor, and unburned propane or other carbon-hydrogen bond-containing materials. The hydrocarbon emission, which would be undesirable in a smog-prone area, can be controlled to a degree by adjustment of the propane feed. The propane adjustment becomes important when disposing of an oxidized feed that continuously diminishes in nitrogen tetroxide. The combustion products do not contain any materials which present any toxicity problems. After a year of usage, the White Sands Test Facility concludes that the disposal units provide a convenient, rapid, and safe method for the disposal of excess nitrogen tetroxide.

05796

Gutsuoff, L.

CLEANER AIR AND THE GAS INDUSTRY (PART I). Am. Gas J. 194 (3); 32-5; 38; 90; 92 (Mar. 1967).

The background of air pollution is briefly reviewed from both a universal and a gas industry viewpoint. The principal causes and sources of air pollution in the United States are discussed. The physiological effects of air pollution are considered. Current methods and means of controlling air pollution are reviewed. Regional aspects of the problem are examined as they affect its severity and bear on the attitudes of the public, the federal and local authorities, commerce, and industry, and more specifically the public utility companies.

05844

THE EFFECT OF ORGANIC MATERIALS IN THE ATMOSPHERE ON VEGETATION. Preprint. California Univ., Riverside. (This is a continuation of the report dated Jan. 21, 1957.)

A study on the effect of irradiated auto exhaust on plant damage is presented. No satisfactory amount of plant damage was produced in any of the combinations of conditions available. These included varying residence time, light intensity, plant exposure time, ratios of the auto operating cycles, and additions of nitrogen dioxide, ozone or raw gasoline. In a few experiments, very slight, but typical oxidant damage was produced along the margins of some leaves, but the amount was too small to be of use in evaluating fuels. Of particular interest is the fact that when ozone was added to the exhaust, no damage occurred. Similarly, when raw gasoline and nitrogen dioxide were irradiated ozone was formed, but no oxidant damage was obtained. No explanation for the failure to obtain plant damage can be offered until the test facilities are made available for intensive trials.##

05850

R. A. Elliott, R. J. Nebel, and F. G. Rounds

THE COMPOSITION OF EXHAUST GASES FROM DIESEL, GASOLINE AND PROPANE POWERED MOTOR COACHES. J. Air Pollution Control Assoc., 5 (2), 101-8 (Aug. 1955). (Presented at the 48th Annual Meeting, Air Pollution Control Association, Detroit, Mich., May 22-26, 1955.)

Exhaust-gas samples were obtained from Diesel, gasoline, and propane-powered motor coaches of similar passenger capacity under idling, accelerating, cruising, and decelerating driving conditions. The samples were analyzed for carbon monoxide, oxides of nitrogen, formaldehyde, and hydrocarbons. In addition, the exhaust-gas flow rates were measured to permit calculation of the emission rate for each constituent at each driving condition. Based on a typical city driving pattern, it was concluded that: 1. The carbon monoxide emission from the Diesel coaches was only a small fraction of that from the gasoline and propane coaches. 2. The differences observed in the emission of oxides of nitrogen, formaldehyde, and hydrocarbons by the 3 coach types were relatively small. No one coach type discharged either the greatest or least amounts of all of these 3 constituents.##

05912

Larsen, R. I.

MOTOR VEHICLE EMISSIONS AND THEIR EFFECTS (CONFERENCE REPORT). Public Health Repts. (U.S.) 77(11), 961-9 (Nov. 1962) (Presented at the Annual Meeting, New England Section, Air Pollution Control Association, Worcester, Mass., April 25, 1962.)

Highlights of the papers presented at the Fifth Air Pollution Medical Research Conference on December 5, 1961, and at the Joint Research Conference on Motor Vehicle Emissions and Their Effects on December 5-7, 1961 are presented. Current research findings on quantities and types of air pollutants from motor vehicles and the effects of these pollutants on the health of man, plants, and laboratory animals are reviewed.

06031

E. E. Leake, R. R. Shaffer, J. A. Vernnen, and R. G. Lunche

AIR POLLUTION FROM AIRCRAFT IN LOS ANGELES COUNTY - A REPORT OF THE ENGINEERING DIVISION, DEC. 1965. 90th Congress, pp. 280-61. ("Air Pollution-1967, Part I (Automotive Air Pollution)" Senate Committee on Public Works, Washington, D. C., Subcommittee on Air and Water Pollution, Feb. 13-16, 20-21, 1967.

The amount of air contaminants emitted into the atmosphere of Los Angeles County as the result of the operation of aircraft was surveyed. The emissions from aircraft with which the District is concerned are those occurring below 3,500 feet altitude and within the geographical boundaries of Los Angeles County. This altitude (3,500 feet) is used as a parameter for the mixing height below which atmospheric dispersion of pollution is inadequate. Observations were made from airport control towers to establish the average time duration of the various operational flight phases for different types of aircraft. These phases are: (1) Taxiing from the terminal to the end of the runway and idling while awaiting clearance from the control tower; (2) Take-off and climb-out through 3,500 feet altitude; (3) Descent from 3,500 feet altitude to touchdown on the runway; and (4) Taxiing from touchdown to the unloading terminal. In observing the departure phase, radio contact was maintained with the pilot in order to learn when the aircraft had climbed-out to 3,500 feet altitude. The distance in miles from the airport when the aircraft was at 3,500 feet altitude was established by radar for both arrival and departure. In the arrival phase, the pilot notified the control tower as the aircraft descended downward through 3,500 feet altitude. It was thus possible to determine the average elapsed time for an aircraft to travel from take-off to 3,500 feet altitude; and from 3,500 feet altitude to touchdown on the runway. Emission factors were then applied.##

06039

R. J. Springer

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE - PART 2 (MONTHLY PROGRESS REPT. NO. 4, APR. 15, - MAY 15, 1967), Southwest Research Inst., San Antonio, Tex., Vehicle Emissions Research Lab. (May 26, 1967) 12p.

Studies of the effect of engine derating on exhaust smoke and odor are in progress. The 6-month fleet test of a smoke suppressant additive, which began on April 1, is continuing. Preparations for the evaluation of the three types of catalytic mufflers for use with two-cycle powered buses are nearing completion. Preliminary studies are under way to establish the feasibility in the laboratory of relating an instrumental odor measurement method with the human odor panel.##

06055

HEALTH PROBLEMS RESULTING FROM PROLONGED EXPOSURE TO AIR POLLUTION IN DIESEL BUS GARAGES. Ind. Health (Japan) 4(1): 1-10 (1966).

An environmental and a health survey of two diesel bus garages in Alexandria (Egypt) have shown an air pollution problem due to the exhaust of engines containing SO2, NO2, aldehydes and hydrocarbons within permissible levels and a relatively higher concentration of smoke. The examination of workers revealed the occurrence of upper respiratory tract disease, chronic bronchitis,

asthma, peptic ulcer, gastritis, and high blood pressure in prevalences higher than expected. Respiratory diseases were probably due to a synergistic effect of smoke and irritants as well as the presence of acrolein and adsorbed hydrocarbons and the smoking habits of workers. Cases of chronic dyspepsia and peptic ulcers were probably related to the nervous tension of night shifts, and other factors as the irregularity of meals and the probable swallowing of dissolved irritants. The blood pressure was relatively "higher" among night shift workers. (Authors' abstract, modified)##

06006

R. L. Stenburg, R. R. Hornsby, R. A. Herrick, A. H. Rose, Jr.

EFFECTS OF DESIGN AND FUEL MOISTURE ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 10 (2), 110-20 (Apr. 1960). (Presented at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Tests were made to determine the effects of fuel moisture content on pollutant emissions from an experimental incinerator of fixed dimensions while varying (1) the amount and distribution of combustion air, and (2) the burning rate as measured by the amount of fuel charged per hour. Overfire combustion air was introduced into the front of the ignition chamber at the grate level, and swept the surface of the burning fuel bed. Underfire air entered through the ash pit and passed up through the fuel bed. Secondary air was introduced through a duct built into the top of the bridge-wall and was discharged through a series of ports opening into the top of the mixing chamber. Dry components of the fuel include equal parts, by weight, of newspaper and corrugated cardboard, mixed in a ratio of three to one with wood chips. Chopped potatoes were substituted for leafy vegetables as the wet component because of their year-round availability. Five-pound charges were prepared with the wet-to-dry components adjusted to provide a fuel with an average moisture content of either 25 or 50%. Particulate, oxides of nitrogen, hydrocarbons, carbon monoxide, and smoke were measured. Because of the basic physical and chemical laws involved, factors demonstrated by this study as affecting the increase or decrease of air pollutants should be the same as those affecting production of pollutants from larger scale incinerators.##

06104

Swarts, D. J., R. W. Wilson and W. J. King

RESULTS OF LIQUEFIED PETROLEUM GAS FUEL FOR AUTOMOTIVE AIR POLLUTION ABATEMENT. J. Air Pollution Control Assoc. 11 (9), 459-9 (April 1961). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The purpose of this investigation is to establish trends and to present some material which could be both interesting and revealing as regards the use of LPG as a motor fuel. Particular emphasis is directed towards its potential for reducing atmospheric air pollution. A major result of this investigation is to provide new data emphasizing the striking differences in the composition of exhaust gas from similar engines operating on liquefied Petroleum Gas fuel as contrasted with their operation on gasoline. Tests show that in the case of LPG exhaust there are essentially no heavy hydrocarbons (C5 or greater) present. Since the olefins are the worst offenders as regards smog formation from gasoline exhaust, the absence of heavy olefins in LPG exhaust suggests the possibility of a significant reduction in automotive smog if enough vehicles in a given area use LPG fuel. The sealed fuel system offers an additional advantage by eliminating the evaporation of fuel to the atmosphere, which is currently a source of added expense to the motorist as well as adding to the total amount of air pollution from cars.

06108

Hoffman, D. and E. L. Wynder

STUDIES ON GASOLINE ENGINE EXHAUST. J. Air Pollution Control Assoc. 13(7), 322-7 (July 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Results of the chemical analysis of exhaust gas of a gasoline engine under city driving schedule and road load are presented. Various carcinogenic and noncarcinogenic hydrocarbons, as well as phenols and nitro compounds, were isolated and identified. A benzene extract of the exhaust gas particulate phase and condensate was applied in five different concentrations to mouse skin. An attempt has been made to explain the observed development of papillomas and carcinomas in terms of its chemical constituents. The analyses of various standard runs with different fuels were reported and the possibility of the most pertinent precursors for phenols and aromatic hydrocarbons are discussed. Caution must be used in regard to the interpretation of these findings in respect to their effect on man. (Authors' summary)

06260

Folke Hedlund, Gustav Ekberg, Sten Erik Rosenstedt

DIESEL EXHAUST GASES. INVESTIGATION WITH PROPOSALS FOR ACTION. (Communications Dept., Stockholm, Sweden, Guidance Group Concerning Development Work in the Field of Motor

Vehicle Exhaust Gas, Sept. 1967. Translated from Swedish, Joint Publications Research Service R-8903-D, 74p., Dec. 12, 1967. 27 refs.

Diesel exhaust emissions and methods of controlling these emissions in Sweden are reviewed. The diesel engine differs from the gasoline engine in several respects, which have a decisive influence on the pollution it emits. It uses a fuel that is less volatile than gasoline. It normally works with a higher excess of air (leaner mixture) and the devices for feed and ignition of the fuel are quite different. Due to the discharge by individual vehicles of dense smoke and by the discharge of foul-smelling substances they have been pointed out by the public as qualified air polluters. Poor maintenance of the engine or intentionally wrong pump adjustments can result in the giving off of such dense smoke that this can constitute a hazard for overtaking vehicles due to impaired or obscured visibility. Diesel engines can give off various types of smoke. One type is the heavy load smoke, which arises through load on a hot engine. Exhaust gases from diesel vehicles, especially under certain driving conditions, contain substances that are irritating to eyes, nose and throat. These include: oxides of nitrogen, hydrocarbons, polycyclic aromatic hydrocarbons, carbon monoxide and sulfur dioxide. The smoke from a diesel engine can be limited by various measures, undertaken on the engine or the fuel pump, the fuel, and finally on the exhaust gases. Regular maintenance of the engine is necessary to keep the smoke values at the lowest possible level. Current and proposed regulation of diesel exhaust emissions are discussed.##

06/V91

Bureau of Mines, Pittsburgh, Pa., Coal Research Center pp. 51-61 (1966).

FLAME CHARACTERISTICS CAUSING AIR POLLUTION. (SECTION VI OF AIR POLLUTION RESEARCH PROGRESS REPORT FOR QUARTER ENDED DECEMBER 31, 1966.)

A study is in progress of the factors that lead to or limit emission of oxides of nitrogen, carbon monoxide, and light hydrocarbons by gas appliances, such as space heaters and hot water heaters. The separate and combined effect of thermally or chemically perturbing the combustion gases above primary flames of lean, stoichiometric, and rich propane-air mixtures are being determined theoretically and also experimentally by means of factorial experiments. Concentrations of oxides of nitrogen with and without flue gas were determined at sampling stations at the top of the primary flames and concentration of oxides of nitrogen was reduced by the addition of either of two simulated flue gases. Flue gas A (containing no air) was more effective in reducing the concentration of oxides of nitrogen than flue gas B (containing air). The data also indicate that for most of the flames with or without flue gas the major increase in concentration of oxides of nitrogen occurred within about the first inch above the primary flame. The effect of addition of flue gas on concentration of hydrocarbons was measured at the top of the primary combustion zone. Hydrocarbons occurred at the edge of all flames when a flue gas was added. Since the addition of flue gas caused partial flame lift it is

possible that some of the initial hydrocarbon plus other hydrocarbons formed from it may be escaping through the dead space between the burner grid and the base of the flame. (Author's summary, modified)##

06A001

CHARACTERISTICS AND PHOTOCHEMICAL REACTIVITY OF VEHICULAR EMISSIONS. (Section VII of air pollution research progress report for quarter ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. AR/61-AR/67.

The effects of halogens, SO2, and humidity on reactivity of a standard ethylene plus NO plus air mixture were studied. The results showed no effects on the system's chemical reactivity as a result of the presence of halogen and SO2; the ozone meter's response to oxidant and NO2, however, was reduced in the presence of SO2. Humidity was found to interfere with the chemical processes in a way that affected significantly the reactivity-measurement results. Further studies on background reactivity in the irradiation chamber showed that the background oxidant formation result of photochemical reactions involving NOx and hydrocarbon at extremely low concentrations. (Author summary)##

06A50

California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. (Sept. 1, 1965). 8pp.

CONSIDERATION OF EMISSION STANDARDS FOR EXHAUST HYDROCARBONS IN TERMS OF QUANTITY (PRELIMINARY REPORT.)

The quantity of exhaust contaminants emitted from motor vehicles is proportional to the product of contaminant concentration and exhaust volume (which in turn is proportional to fuel consumption); a concentration standard essentially allows quantity of emissions from individual vehicles proportional to fuel consumption. By requiring the same concentration of contaminants to be emitted by all vehicles, the concentration standards are perhaps more restrictive to small cars. For this reason, it has been suggested that standards based on quantity would be more equitable. Summarized in this report are data on contaminant concentration in exhaust, and exhaust volume flow rates for vehicles classified according to engine displacement. There is no simple relationship between engine size and quantity of hydrocarbon, carbon monoxide and oxides of nitrogen emitted. Quantity emissions of hydrocarbon from all classes of vehicles fall within a narrow range, whereas those of carbon monoxide and oxides of nitrogen vary markedly from class to class. Exhaust hydrocarbon concentration measured on one group of 50 class A cars (displacement less than 140 cu in) had a range of 2040 ppm; the smallest value was 940 ppm while the largest was 3100 ppm. Similar variations also exist in the data for other classes of vehicles. The exhaust flow rates are lower in smaller displacement engines. The exhaust flow rates, as well as the fuel consumption rates were determined from testing vehicles on a seven-mode dynamometer cycle. Exhaust

flow rates might be expected to be closely proportional to fuel consumption rates. However, the relative exhaust flow rates between classes do not follow closely the relative fuel consumption rates, although similar trends are apparent. The difference may be due to an insufficient number of cars tested for exhaust volume.##

06488

Squires, Arthur M.

CLEAN-FUEL POWER CYCLES. American Society of Mechanical Engineers, New York, 67-WA/PWR-3, 16p., 1967. 58 refs. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Pa., Nov. 12-17, 1967.

A number of supercharged-boiler power cycles are surveyed which are regarded as especially suited for use with clean fuels, i.e., fuels which are dust-free and sulfur-free. The cycles are intended for use in "clean power" systems, which offer the prospect that power can be generated not only without discharge of objectionable atmospheric pollutants but also more cheaply. In such systems, dirty fuels would first be converted to a clean fuel gas by processes which recover elemental sulfur for the market, and the clean gas would be committed to an advanced power cycle engineered for clean fuel and affording higher efficiency. The cycles have in common the feature that an unusually large amount of superheat is added to the steam, so that steam exhausts from an expansion in a highly superheated condition. The exhaust is preferably at atmospheric pressure or above. The superheated steam is cooled against boiler feed water, and is then sent to a low-temperature power-recovery step. In some cycles, high-level heat is added indirectly by heat exchange from flue gases at high pressure. In others, high-level heat is added to the steam directly in the form of products of combustion of a clean fuel either with air or with oxygen provided by an improved version of the historic Brin process. Heat rates are given postulating methane as fuel, with steam at 2,400 psia, indirect additions of heat limited to 1200 F, and direct additions of heat limited to 1500 F. Detailed economic evaluations of the several cycles are not yet available, and only qualitative statements can now be made concerning their probable relative worth. (Author's abstract)##

06791

F. Lenaigre

AIR POLLUTION BY MOTOR VEHICLES. LA POLLUTION DE l'AIR par les vehicules Automobiles. Pollut Atmos (Paris) 8, (32) 419-32, Dec. 1966. Fr.

A general review is presented of the air pollution caused by motor vehicles. The known facts and the current research on air pollution is presented on the basis of papers given before the Strasbourg Conference in June of 1966. The various polluting agents are considered and the control measures which involve the fuels and the engines are described. Recent work carried out in both France and the United States is discussed with the differences between the motor traffic conditions taken into account. French legislation is

discussed emphasizing the importance of proper engine maintenance in air pollution control. The results of proper carburetor adjustment during idling are a good example of a simple method of control. It is concluded that the eventual solution will not be easy. The necessity of preserving "green areas" as method of air pollution control is brought out since these plots have a considerable absorbent role.##

06808

G. Scansetti-Sforzolini

TOBACCO SMOKE IN AN ENCLOSED SPACE. Il Fumo di Tabacco Negli Ambienti Confinati. Fumi Polveri (Milan) 7 (2-3), 38-41 (Mar. 1957) It.

The amount of polycyclic aromatic hydrocarbons present in cigarette smoke as well as the amount of tar and nicotine present in filtered and unfiltered cigarette smoke (the part inhaled and the part in the surrounding air) was investigated. For the smoke parameters, the following standards were used: length of stub, 23 mm; period of inhalation, 3 sec; intermittence period, 60 sec; volume inhaled, 35 ml. The method used to determine the amount of polycyclic hydrocarbons present was based on chemical treatment of the liquid through which smoke was bubbled, then separation of alumina and silica gel columns, followed by spectrophotometric analysis of the eluates. The following hydrocarbons were obtained in the smoke inhaled and in the smoke in the ambient air, respectively: Anthracene - 4.85, 9.40 - gamma/100 cigarettes; Pyrene - 4.56, 7.88 - gamma/100 cigarettes; 1/2-Benzopyrene - 2.99, 8.18 - gamma/100 cigarettes. Chloroform extraction was used in the determination of the tar content. The nicotine content was determined by distilling the acetic extract after addition of 10% NaOH. The results indicate that the amount of tar and nicotine is greater in the ambient smoke than in the inhaled smoke. Among the Italian cigarettes studied, those with filters showed higher tar and nicotine content than the non-filtered cigarettes.##

06950

Liebhafsky, H. A.

FUEL CELLS AND FUEL BATTERIES--AN ENGINEERING VIEW. IEEE (Inst. Elec. Electron. Engrs.) Spectrum, 3(12):108-16, Dec. 1966. 9 refs.

Fuel cells electrically connected (in series, parallel or series-parallel) make fuel batteries. Fuel cells should react conventional fuels (by which is meant the fossil fuels and substances readily derived therefrom) electrochemically with oxygen, preferably from air. A fuel cell, therefore, is an electrochemical cell in which energy from such a reaction is converted directly and usually into low-voltage dc energy. Fuel batteries are discussed in terms of the various types of fuels, efficiency, reliability, life, and operating temperatures. All of these properties are tied in with the important consideration of economics.##

07089

Rosen, A.E., R. T. Skeel, and R. B. Ettinger

RELATIONSHIP OF RIVER WATER ODOR TO SPECIFIC ORGANIC CONTAMINANTS. J. Water Pollution Control Federation (Presented at the 35th Annual Meeting, Water Pollution Control Federation, Toronto, Canada, Oct. 7-11, 1962.) 35(6):777-782, June, 1963.

The results of odor tests conducted in conjunction with a study of organic contaminants in the Kanawha River at Nitro, West Virginia are reported. A major part of the odor of the river can be ascribed to 11 organic chemical compounds that were identified and measured. Naphthalene, Tetralin, Styrene, Acetophenone, Ethyl benzene, Bis(2-chloro-isopropyl) ether, 2-Ethyl hexanol, Bis(2-chloroethyl)ether, Di-isobutyl carbinol, Phenyl methyl carbinol and 2-Methyl-5-ethyl pyridine. Threshold odor concentrations for each of these compounds were determined from the responses of an odor panel. A mixture of all the identified pollutants, in the same proportions as found in the river, was shown to contribute nearly twice the amount of odor that can be calculated on the basis of the sum of the individual contributions. Thus, it was indicated that odor synergism plays its role as effectively in polluted streams as in the simulated instances tested in the laboratory.##

07107

E. C. Larson and R. E. Sippie

LOS ANGELES RULE 66 AND EXEMPT SOLVENTS. J. Paint Technol. 39(508):250-264 (May 1967). (Presented at the Los Angeles Society for Coatings Technology, Calif., Oct. 12, 1966; at the Golden Gate Society, San Francisco, Calif., Oct. 17, 1966; and at the Portland, Seattle, and Vancouver Sections of the Pacific Northwest Society, Washington, Oct. 19, 20, and 21, 1966.)

The implications of Rule 66 of the Los Angeles County Air Pollution Control District, which controls the emissions of volatile organic solvents, are reviewed for their effect on the paint industry. The various provisions of Rule 66 are discussed to illustrate the desirability of using exempt solvents. Saturated hydrocarbons (iso, normal, and cycloparaffins), alcohols, esters, ether-alcohols, and non-branched ketones are entirely exempt. The exempt limits for photochemical reactive materials are as follows: olefins - 5%, C8 plus aromatics - 8%, and toluene, ethylbenzene, branched ketones, and trichloroethylene - 20%. With mixtures of these photochemical reactives the total allowable amount is 20%. The problem facing the paint industry is the replacement of the aromatic solvents which are good solvents, but are photochemically reactive. High solvency naphthenic base stocks will help offset the solvency of the displaced aromatics for the long oil alkyds and many medium oil alkyds. Small quantities of non-exempt solvents can be used provided the escaping vapors are condensed or burned efficiently. The General Services Administration has asked for a revision of all their purchasing specifications to conform to Rule 66.##

07216

Bethge, Per Olof and Lalla Ehrenberg

IDENTIFICATION OF VOLATILE COMPOUNDS IN KRAFT MILL EMISSIONS. Svensk Papperstid. (Stockholm), 70(10):347-350, May 31, 1967. 3 refs.

Identification of compounds contributing to the odour from kraft mills was accomplished by gas chromatography, and in some cases in combination with mass spectrometry. Attention was centered on the most volatile compounds. Besides seven terpenes, 25 compounds were identified.##

07224

E. Fiala and E. G. Reschmann

THE EXHAUST GAS PROBLEM OF MOTOR VEHICLES. (Part 1). Zum Abgasproblem der Strassenfahrzeuge. (Teil 1). Automobiltech. Z. (Stuttgart) 67(9), 302-8 (Sept. 1965). (Ger.)

The various pollutants in exhaust gases and their origins are reviewed. The effects of mixing ratios, lubricants, evaporation from tanks and possibilities for reducing the amounts of harmful emissions are discussed. Among other measures, fuel injection and catalytic afterburners are mentioned. The exploration of new forms of energy storage and conversion are discussed. Fuel cells, and primary and secondary batteries are discussed. As a criterion kg/hp, is used.##

07230

H. Horn

(AIR POLLUTING FUELS FROM THE VIEW POINT OF HEALTH PROTECTION OF THE POPULATION IN RESIDENTIAL AREAS.) Luftverschmutzende Energietraeger unter dem Aspekt des Gesundheitsschutzes der Bevoelkerung in Wohngebieten. Z. Ges. Hyg. Grenzg. (Berlin) 13 (1), 30-8 (Jan. 1967). (Ger.)

A survey of the carriers of thermal energy specific for Germany, particularly considering solid fuels on the brown coal basis, is presented. A study was made of the effect of these household fuels on air pollution throughout Germany. Frequently, the maximum allowable concentrations of pollutants, especially SO2, are exceeded. The importance of ashes, sulfur compounds, nitric oxides, and benzopyrene as pollutants is emphasized. Epidemiological studies show the existence of correlations between high concentrations of air pollution and occurrence of diseases of the upper respiratory tract. The possibility of changing to a distant heat supply by block heating stations or long-distance heating stations is discussed. The type of fuel is of considerable importance. Values for maximum allowable concentration should be strictly adhered to by technical planners. (Author's summary, modified)##

07299

Gorzlova, O. N. and F. F. Dikun

THE DETECTION OF 3,4 BENZPYRENE IN SOME SPECIES OF SMOKED FISH. (FLUORESCENCE-SPECTRAL ANALYSIS). Text in Russian. Vopr. Onkol., 4(4):390-405, 1958. 7 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 126-139, March 1960.
CFSTI TT60-21188

An investigation was made of the presence of 3,4-benzpyrene in smoked fish commonly used in the U.S.S.R. The fish were subjected to saponification. Chromatographic partitioning was made with a 50 g column of aluminum oxide. The unsaponifiable fraction dissolved in 30 - 50 ml of benzene was adsorbed by the aluminum oxide column. Smoke used for processing fish contained 3,4-benzpyrene, which, together with other substances contained in the smoke, was deposited on the walls of smokehouses and on the surface of the processed products. It was shown that 3,4-benzpyrene penetrated into the inner part of the fish; especially fish not covered with heavy fish scales, and split fish, in which the contact between the flesh of the fish and the smoke was direct. In the case of the sprat, smoked by the hot or cold processes, 31 to 38% of the total 3,4-benzpyrene contained in the fish penetrated into the flesh; in the case of the bream or split Rutilus, 25% of 3,4-benzpyrene penetrated into the flesh; and for the split Barbel up to 87% penetrated into the flesh. In cases of smoked whole bream, Rutilus, Pelecus and Chalcalburnus, which are covered with heavy scales, the 3,4-benzpyrene content of the flesh was many times less than its content in the same types of fish processed after splitting. The results of the investigation indicated that the content of 3,4-benzpyrene in smoked fish did not depend solely on the process by which it was smoked, whether cold or hot, or whether the smoke came from openly burned wood or from special smoke generators.**

07300

Dikun, P. P. and I. I. Nikberg

A STUDY OF AIR POLLUTION WITH 3,4-BENZPYRENE IN THE VICINITY OF AN OLD PITCH-COKE PLANT. Vopr. Onkol., 4(6):669-674, 1958. 6 refs. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 135-140, March 1960.
CFSTI: TT60-21188

Analyses were made of three sets of samples collected in the area of the pitch-coke plant at different times, different distances, and in different directions from the plant: set 1 consisted of 6 samples of dust sweepings; set 2 consisted of 8 sedimentation dust samples, and set 3 consisted of 3 aspiration samples. A comparison of pollution before and after the plant was modernized shows that 3,4-benzpyrene content of sweepings collected between the inside and store windows before the plant was modernized was 100 times greater than after the improvements were installed. (0.03 to 0.05% as against 0.0003%) Dust collected in 1955 from the bricks stored on the plant grounds contained 10 times as much 3,4-benzpyrene as the dust collected between the

windows in 1957 (0.001 to 0.0099 against 0.00018). The fact window pane washings gave negative or trace tests for 3,4-benzpyrene demonstrated the significant reduction in air pollution attained by the plant combustion modernization. This is further confirmed by a comparison of analyses of aspiration samples. After the introduction of the improvements aspiration samples of 15 to 45 cubic meter of air contained only traces of pollutants. Comparison of analytical results collected in 1958 with samples similarly collected in 1955 also shows a substantial reduction in total pollution (95, 370 and 820 mg per cubic meter in 1955 as against 2.5 mg in 1957) and in 3,4-benzpyrene (0.002, 0.005, 0.400 mg per cubic meter in 1955 as against 0.0008 mg in 1957). Thus, results of the 1957 investigation revealed that pollution of the air in the vicinity of the pitch-coke plant decreased sharply after the coke furnaces were modernized.##

07451

Scharf, F. B.; B. B. Goshgarian, H. R. Nelson, and G. L. Rody

THE MEASUREMENT OF THE EXHAUST COMPOSITION OF SELECTED HELICOPTER ARMAMENT. Air Force Rocket Propulsion Lab., Edwards AFB, Calif. and Army Aeromed. Res. Unit, Fort Rucker, Ala., Proj. No. 1A0 25601 1A 019, Task No. 051, Rept. No. AFRPL-TR-67-203 and USAARU-67-10, 46p., June 1967. 4 refs.

A study of the exhaust composition of rapid fire machine guns and rockets has been conducted. Methods of analysis were evaluated and exhaust compositions for the 50 cal and 7.62mm machine gun and the 2.75" rocket were determined. A rapid scan infrared spectrophotometer was used for immediate examination of effluent gases in order to detect reactive species. The exhaust gases were analyzed at concentrations as high as 1000 times those present in helicopters to minimize the chance of missing any significant toxic product. A qualitative and quantitative analysis of gas phase and aerosol components is given. It may well be that the proportion of carbon monoxide in the exhaust is so high that permissible exposure times can be selected on the basis of its concentration alone while still limiting exposures to all other toxic materials to safe levels. However, significant amounts of nitrogen dioxide, ammonia, carbonyl sulfide, hydrogen cyanide, lead and copper were found.##

07566

J. C. Torelli, Jr.; E. D. Harvard, L. P. Leggett, Jr.

ENVIRONMENTAL ASPECTS OF NUCLEAR AND CONVENTIONAL POWER PLANTS. Ind. Med. Surg., 36(8):612-619, June 1967. 20 refs. (Presented at the 5th Inter-American Conference on Toxicology and Occupational Medicine, Miami, Fla., Aug. 1-5, 1966.)

Inherent difficulties in comparing the health risks of conventional and nuclear power plants are pointed out, and currently available data are presented. Efforts of the Public Health Service to establish the relative health risks of the power sources are indicated. There is a lack of accepted

standards for the permissible concentrations of nonradioactive elements in the environment and also a limited amount of data on the exact composition of the atmospheric radioactive releases from operating nuclear plants. In the year 2000, the U.S. power-generating capacity is expected to increase from the present 11 x 10 to the 15th powerBTU/yr to 70 x 10 to the 15th power BTU/yr with the proportion of this capacity provided by nuclear power increasing from 1% in 1966 to 41% in 2000. The production of oxides of sulfur produced by a 1000 MWi power station when fired by coal, oil, or gas is given showing emission rates in million lb. per year of: 106 for coal; 116 for oil; and 0.027 for gas. The generation of electricity in the U.S. is responsible for 15.6 million tons of atmospheric pollutants per year. There are some radioactive materials such as 1.1 ppm of 238U and 2.0 ppm of 232Th in coal. The only case in which a nuclear plant might be close to requiring as much dilution air as a fossil fuel plant to meet the required conditions would be to prevent the contamination of milk by radioactive iodine. The Public Health Service plans to conduct a study of two oil-fired plants and two nuclear plants at the same site to evaluate the environmental release and effects from both types of plants with identical meteorological, hydrological, population, and topographic features.**

07561

Kaiser, E. R., J. Halitsky, R. E. Jacobs, and L. C. McCabe

PERFORMANCE OF A FLUE-FED INCINERATOR. J. Air Pollution Control Assoc., 9(2):85-91, Aug. 1959. 7 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-28, 1958.)

A limited survey of representative modes of operation and results of one flue-fed incinerator is reported. The tests were conducted to serve as a basis for comparison with future tests on identical incinerators with modifications to improve combustion and reduce air pollution. The incinerated refuse from a 120-apartment building was approximately 600 lb. a day. The flue-fed incinerator reduced the apartment refuse to about 9% of its original weight and to about 10% of its original volume. The bulk density of the refuse averaged 8.1 lb/cu ft. in the incinerator. The residue had a bulk density of 15.4 lb/cu ft. in the ash cans. The residue averaged 64% metal and glass, 12% ash, 16% combustible, and 8% moisture, excluding quench water. The air normally supplied to the furnace was 10 to 20 times the theoretical air necessary for complete combustion. The high excess air reduced the furnace temperatures and undoubtedly affected adversely the combustion of volatile matter and emission of fly ash. The infiltration air entering the flue through vents on the service doors and cracks averaged 15% more than entered the furnace. Sealing the vents reduced the infiltration air to the flue to 45% of the furnace air during the period of fast burning. The peak furnace temperatures varied from 970 to 1200 deg F. The emissions of particulate matter to the atmosphere via the flue gases ranged from 0.85 to 1.55% of the refuse weight. The weights of particulate matter ranged from 2.5 to 4.7 lb/1000 lb of furnace gas corrected to 12% CO2. The emission of eight noxious gases totaled 0.9 to 1.0 lb/100 lb refuse. The presence of additional unburned hydrocarbons in the flue gases was confirmed

by mass-spectrometer tests. The average odor concentrations ranged from 2.5 to 100 ASTM odor units. The incinerator had inherent features of design and operation that caused high emissions of particulate matter and unburned organic compounds. The charging of refuse during burning could contribute to the discharge of particulate matter. Suggested modifications to the conventional incinerator include control of the furnace air supply, better mixing of air and volatile products from the burning refuse in a zone of high temperature, new furnace designs to eliminate the necessity for hooking and raking the refuse and residue, and residue removal with minimum air flow.##

07570

Kireeva, I. S.

ATMOSPHERIC POLLUTION WITH 3,4-BENZPYRENE IN THE VICINITY OF A COAL BRIQUET FACTORY. (O zagryaznenii atmosfernogo vozdukha 3,4-benzpirenom v rayone brikетnoi fabriki.) Text in Russian. Gigiena i Sanit., 30(7), July 1965. 9 refs. Engl. transl. by JPRS, Hyg. Sanit., 30(7):126-128, July 1967.
CFSTI: TT66-51033/3

An investigation was conducted of a large briquet factory which uses 11% coal pitch for the binding of coal fines, so that the 3,4-benzpyrene content in the coal briquets reaches 0.14%. The process of briqueting includes crushing bituminous coal and pitch, mixing them in a certain ratio, and molding the briquets. Determinations were made of the amounts of 3,4-benzpyrene in the gases discharged by the press shop, in the atmosphere, and in the dust falling at distances of 200 to 1000m from the factory. Tarry substances were extracted with pure nonfluorescent benzene and fractionated on a chromatographic column with an activated alumina mixture. Identification of 3,4-benzpyrene was accomplished by comparing the fluorescence spectra of the individual fractions frozen in liquid nitrogen against the fluorescence spectrum of a standard 3,4-benzpyrene. The quantity of the latter was determined photoelectrically. Thus, 3,4-benzpyrene was found in all samples within the radius of 1 km from the factory, the concentration decreasing regularly with increasing distance from the factory. However, concentrations exceeded the control determinations made on the windward side (0.19--0.30 micrograms/100 cu. m.) even at a distance of 1000 m. The results indicate the need to eliminate coal pitch from the technological process and introduce a new briqueting technology using noncarcinogenic grades of petroleum bitumens as the binder .###

07593

Panel on Electrically Powered Vehicles

THE AUTOMOBILE AND AIR POLLUTION: A PROGRAM FOR PROGRESS. Los Angeles County Air Pollution Control District, Calif.; 51p., Oct. 1967.
GPO: 0-278-482

Air pollution problems from the viewpoint of automotive transportation were studied in general and all possible alternatives to the current gasoline engine were investigated by

the Panel on Electrically Powered Vehicles. The Panel made sixteen recommendations for the Federal Government with respect to its role concerning air pollution resulting from automotive emissions. Technology and the control of automotive air pollution and the role of industry are also discussed.**

075961

Styles, H. E., J. Verbon, and J. Lauther

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES. Preprint, London Transport, England; Transport Administration, Brussels, Belgium and Medical Research Council Air Pollution Research Unit, London, England, (46p.), 1966. 8 refs. (Paper No. WHO/AP/67.28.)

An indication of the nature of air pollutants which may result from the combustion of fuel, an explanation of the differences between petrol and diesel engines which give rise to the emission of exhaust products having different characteristics, and a comparison between the two types of engines in respect of their propensity to cause pollution of the atmosphere is presented. Evidence derived from medical investigations concerning possible health hazards arising from motor vehicle exhausts is reviewed. An indication is then given as to means whereby satisfactory operation of diesel engined vehicles may be achieved without production of objectionably smoky exhausts. There follows a description of the legislative procedure which one country (Belgium) has introduced in the interests of ensuring that vehicles are so operated as to ensure that they emit no unduly offensive exhaust products and, as an appendix, an outline is provided of measures taken by London Transport to prevent air pollution by diesel-engined public service vehicles. The fact that maladjustment or incorrect operation of a diesel engine almost inevitably leads to the production of an objectionably smoky exhaust has given rise to prejudice against the use of such engines in road vehicles and an ill-informed impression that the exhaust which they emit causes more serious atmospheric pollution than does the exhaust from petrol engines.**

07623

Larson, Gordon P., John C. Chipman, and Erwin F. Hauper

DISTRIBUTION AND EFFECTS OF AUTOMOTIVE EXHAUST GASES IN LOS ANGELES. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 5; Society of Automotive Engineers, New York, 1966, p. 7-16. 12 refs. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1955)

Hydrocarbons or gasoline vapors are known to be an important factor in producing several of the deleterious effects of smog, however, one question to be answered is whether or not the removal of hydrocarbons from all other sources in the community would relieve the burden on the air sufficiently to avoid any control measures on auto exhaust. The measurements of the quantity of hydrocarbons emitted by internal combustion engines another source of hydrocarbons contributing to the buildup were explored. The areas of exhaust gas concentration buildup were determined by a study of

Los Angeles traffic. Studies now clearly show that removal of all other sources of hydrocarbons from refineries and from the distribution of gasoline will not lower the concentration of hydrocarbons in downtown Los Angeles area and the north-central section of the County sufficiently to relieve the eye irritation, crop damage effects, and high ozone content of the air in those areas. The Air Pollution Control District recommends that engineering studies seeking to remove hydrocarbon vapors from exhaust gases should strive for a 90% overall removal under conditions of operation experienced in heavy traffic.

07625

Haas, G. C.

THE CALIFORNIA MOTOR VEHICLE EMISSION STANDARDS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 39-44. 5 refs. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1960)

The legal and technical bases of the California standards are reviewed and the air pollution laws of California summarized. The evolution of air quality standards is described. The translation of air quality standards into motor vehicle emission standards is described along with a statement of the underlying assumptions concerning the relationship of the photochemical smog effects to the atmospheric concentrations of primary pollutants emitted to the atmosphere from motor vehicles and other sources. Driving cycles, analytical methods, evaluation of device warmup characterization, and related problems are also discussed.

07626

Newman, J. C., and G. H. Miller.

DETERMINATION AND HYDROCARBON EMISSION RATE BY CONTINUOUS AIRFLOW MEASUREMENT AND EXHAUST ANALYSIS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 70-80. 16 refs. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1957.)

Two instruments developed as part of a program of portable instrumentation for measuring the emission of incompletely burned hydrocarbons in the exhaust of automotive vehicles on the road are described. The first instrument is an infrared interference filter photometer which measures and records the concentration of hydrocarbons in the exhaust by means of their optical absorption at 3.39 microns. The second instrument is a matrix flow meter developed to measure and record total engine air consumption in a moving vehicle operated in normal service. These two instruments used together will determine the rate of emission of exhaust gas components from vehicles operated in characteristic modes. The instrumentation is relatively portable, compact, simple to use, and adaptable to automobiles. (Authors' abstract, modified)

07629

May, Gilbert, and W. G. Fagley

FIELD SURVEY OF EXHAUST GAS COMPOSITION. In: Vehicle Emissions SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 102-120. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

The operations and results of a comprehensive field survey conducted in Los Angeles are reported. The purpose was to measure exhaust emissions from a representative group of cars during operating conditions encountered in metropolitan driving. Two hundred and ninety-three cars were tested under a schedule of driving conditions which included a variety of accelerations, cruise speeds, decelerations, and idle. During the test cycle, exhaust gases were continuously analyzed by the Model 20 Liston-Becker spectrometer for CO, CO2, and unburned hydrocarbons and by Model 15 Liston-Becker spectrometer for hydrocarbons. Airflow was measured continuously by the viscous airflow meter. Indications from these instruments were registered by a recording oscillograph. An oscillogram processor was used on location for developing the 10,000 ft of recordings taken during the test. Oxides of nitrogen were determined by analyses of grab samples taken during the acceleration and cruise cycles. A description is given of preparatory operations; survey operations including instrumentation, test procedure, test cycle, and supporting operations; data handling and calculations; and test results. Details and examples of calculations of results and confidence intervals, along with calibration charts for the instruments used are appended.

07632

Wentworth, J. T.

CARBURETOR EVAPORATION LOSSES. In: Vehicle Emissions SAE Tech Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 146-156. 8 refs. (Presented at the Society of Automotive Engineers, Jan. 1958.)

An investigation was made of vapor losses from the carburetors of five 1956-1957 automobiles during 7-mile 'suburban' and 'city' driving. The test cars were selected to represent several different carburetor venting arrangements. Generally, carburetor losses were found to increase with increasing carburetor temper[carburetor vent design determined whether the vapor formed was vented to the atmosphere, where it contributed to odor and air pollution problems, or whether the vapor was consumed by the engine where it could cause engine roughness at idle, especially under high temperature conditions. (Author's abstract, modified)

07635

Hagen, D. F. and G. W. Holiday

THE EFFECTS OF ENGINE OPERATING AND DESIGN VARIABLES ON EXHAUST EMISSIONS. In: Vehicle Emissions, SAE Tech. Progress Series Vol. 6, Society of Automotive Engineers, New York, 1964, 206-221. 9 refs. (Presented at the Society of Automotive Engineers, National Automobile Week, March 1962.)

To determine the influence of engine variables on the composition of exhaust gas, engine dynamometer tests were conducted on single and multicylinder reciprocating engines. The following engine variables were investigated; air-fuel ratio, power output, engine speed, spark timing, exhaust back pressure, valve overlap, combustion chamber deposits, and intake manifold pressure. Hydrocarbon concentrations were found to be considerably affected by changes in air-fuel ratio, spark timing, intake manifold pressure. Hydrocarbon concentrations were found to be considerably affected by changes in air-fuel ratio, spark timing, intake manifold pressure, and combustion chamber deposits. Somewhat less change in hydrocarbon concentration was obtained by varying valve overlap and engine speed. Changes in engine power output and exhaust back pressure had little effect on hydrocarbon concentrations. Carbon monoxide concentrations were principally affected by changes in the air-fuel ratio. No other variables affected carbon monoxide concentration except where air-fuel ratio was indirectly influenced. The influence of changes in the variables on hydrocarbon and carbon monoxide emissions in pounds per hour was also determined. Vehicles were tested on the road and chassis dynamometer to investigate the effect of air-fuel ratio, spark timing, and valve overlap on hydrocarbon and carbon monoxide concentrations. Carburetion leaning, spark timing retardation, and reduction of valve overlap produced concentration reductions in line with those predicted from engine dynamometer studies. (Author' abstract)

07617

Nebel, G. J.

AUTOMOBILE EXHAUST GAS TREATMENT - AN INDUSTRY REPORT. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 269-273, 298. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Aug. 1957.)

Various methods of treating automobile exhaust to remove hydrocarbons have been explored. Most of the usual gas-phase separation techniques were quickly rejected as impractical for automotive use. Only devices employing the principle of oxidation appear feasible. A number of experimental afterburners and catalytic converters have been tested, and their performance characteristics are briefly summarized. Experience to date has shown that exhaust treating devices will pose some special heat, noise, and design problems for the automotive engineer. (Author's abstract)

07638

Schaldenbrand, H., and J. H. Struck

DEVELOPMENT AND EVALUATION OF AUTOMOBILE EXHAUST CATALYTIC CONVERTER SYSTEMS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 274-290, 14 refs. (Presented at the Society of Automotive Engineers, National Automobile Week, March, 1963.)

A program was conducted to determine the performance and catalyst life of the low temperature catalytic converter system. A program was also aimed at defining and resolving problems associated with the operation of this sytem on vehicles. Much of this work involved principles common to those encountered with any catalytic converter system. An engine dynamometer screen test was later devised and used to evaluate catalysts capable of oxidizing both hydrocarbons and carbon monoxide. Catalysts were selected from these tests for evaluation on vehicles. Tests of vehicle systems employing catalysts selected from the screening tests showed the systems to be inadequate from the standpoint of the catalysts maintaining oxidation performance for extended mileage. If a satisfactory catalyst can be found to improve the performance of the systems to an acceptable level, much work remains to be done to develop an acceptable catalytic converter system for vehicles. (Authors' abstract, modified)

07690

Cosinelli, A.

AN EASILY CONTROLLABLE AIR POLLUTION SOURCE: NAPHTHA ENGINES. (Una fonte di inquinamento atmosferico che e relativamente facile controllare: i motori a nafta.) Text in Italian. Ann. Sanita Pubblica (Rome), 28(2):167-175, March-April 1967. 9 refs.

The exhaust from diesel engines (naphtha engines) in contrast to that from gasoline engines is not usually an important source of air pollution. When in good condition and operated properly it emits less toxic gases (CO and hydrocarbons) than a spark ignition engine. Atmospheric pollution from diesel engines depends to a large extent upon the driver as well as on the mechanical condition of the vehicle. Public education is needed and punitive action against offenders. Switzerland has established norms to prevent vehicular air pollution: rapid acceleration and deceleration must be avoided, overloading is forbidden, the vehicle must be frequently checked and kept in excellent working condition. Black exhaust fumes quickly identify an offending vehicle. Maximum permissible opacity for the exhaust fumes can be established by the use of opacimeters. The ideal opacimeter should be ruggedly made to withstand all road conditions and the 700 deg. C temperatures of the gases emitted, it should be easily installed and easily read on either a stationary vehicle or a moving one. The most frequently used types (Hartridge, UTAC, Bosch) and the advantages and disadvantages of each are discussed. Permissible values (Hartridge) are given for different types of vehicles. A schematic drawing is given of the Bosch opacimeter.

07699

Haga, J. A., H. Wong-Woo, and R. G. Mason

A STATUS REPORT ON MOTOR VEHICLE POLLUTION IN CALIFORNIA. J. Air Pollution Control Assoc., 17(7):435-438, July 1967.

The accomplishments to date indicates problems that exist, and the outlook for control are reviewed by analysing emissions trends in four urban areas in the state. To illustrate the effect of the

current anticipated control efforts in California, six charts are presented showing the emission estimates in four areas from 1940 to 1980. A review of all the factors involved indicates that there is no simple and inexpensive solution to the complex problem of motor vehicle created air pollution. The problem has many aspects. It is legal, political, social, economical, and technological. The final solution must incorporate considerations for all these aspects. The motor vehicle control program in California has reduced emissions of hydrocarbons and carbon monoxide into the atmosphere. In spite of the increasing number of vehicles there has been a reversal in emission trends for the first time. If the goal of prevar air quality is to be achieved, there must be a high degree of emission control. Consequently, the program requires that effective systems be available, and that virtually no cars be exempt. Lack of efficiency control of some emissions, large numbers of cars uncontrolled, and deterioration in efficiency of control systems will lead to air quality poorer than that desired. Under the present program, which is oriented toward the installation of control systems on new cars, the reduction of contaminants emanating from motor vehicles will be gradual. In order to accomplish a rapid improvement, within a few years, exhaust emissions from all cars (new and used) must be controlled.##

07851

Plust, H. G.

FUEL CELLS: PRINCIPLE OF OPERATION, DESIGN AND PRESENT STATE OF THE ART IN FUEL CELL DEVELOPMENT. (Die Brennstoffzellen: Wirkungsweise, Aufbau und Heutiger Entwicklungsstand der Brennstoffzellen.) Neue Zuricher Zeitung, Technol. Suppl. No. 111, Jan. 12, 1956. 8 refs. Engl. transl. no. J-1152, 13p.; Dec. 22, 1956. Translated from German.
CFSTI, DDCI AD 805116

The fuel cell has achieved great progress in recent years. With the aid of this cell it is possible to convert the chemical energy of fuels directly into electrical energy without any limitation due to the so-called Carnot's degree of effectiveness. The present-day state of the art in fuel cell development is marked by the fact that for greater output (above 1 kW) only those fuel cells that operate on hydrogen as fuel and oxygen as oxydizer are sufficiently far developed in order to test them for practical applications. DC voltages of 700 volts could be achieved by placing such cells in series; however, it is customary to use batteries below 100 volts. Performance weights of 10 to 45 kg/kW and performance volumes of 10 to 40 cu dm/kW are usually stated for these batteries. These data are reduced by the necessary accessories (control system, heat exchange, water removal, converter, etc.) which must first be developed and newly designed in many cases. It is possible to purchase a 1kW fuel cell for about 10,500 dollars.##

07925

Beighton, J.

THE SPECIAL INDUSTRIAL PROCESSES. Roy. Soc. Health J. (London). 87(4):215-218, July-Aug. 1967. 2 refs. (London)

The air pollution problems of a group of industries which produces sulfuric acid, nitric acid, petroleum and petrochemicals, iron and steel, copper, aluminum, gas, ceramics and electric power are reviewed. The basic technical approach is to avoid the formation of the emission by design of the process, then to require the treatment of any unavoidable emission, and finally to require adequate dispersal of any residual amount which has to be discharged. The legislation is designed to compromise between safeguarding of public health and amenities and providing for a realistic acceptance with adequate control of special processes. Although the loss of gases in the manufacture of sulfuric acid is limited to 2% of the sulfur burned, the loss from a contact acid plant with a 500-ton-per-day capacity may be considerable so that chimney heights as high as 450 ft may be required. Acid mist from contact plants burning sulfur is a special problem as it is difficult to control and its occurrence is unpredictable. There are two nitric acid plants in Britain equipped with catalytic tail-gas reduction units which should solve the problem of brown nitrous fume emission to the air. The use of special fixers is required to control H_2S and mercaptans emitted by oil refineries. In the steel industry the development of the Fuel-Oxygen-Scrap process is regarded as an alternative to the electric arc furnace. It is claimed that melting and refining can be carried out without exceeding a fume level of 0.05 grains per cu ft.##

07945

A. Parker

REDUCTION AND PROBLEMS OF AIR POLLUTION IN GREAT BRITAIN 1938 TO 1976. Roy Soc. Health J. (London), 87(4):204-209, July-Aug. 1967.

Air pollution from the use of fuels is discussed. 1938 was chosen as the beginning date because the 1939-1945 war caused a coal shortage. The smog of 1952, which killed 4,000 people in Greater London, stirred public opinion. The Clean Air Act of 1956 which resulted produced a marked reduction in smoke emission and an improvement in the fuel use efficiency. In spite of the decrease in the use of coal by railways, collieries, industrial processes, and domestic heating, there has been an overall increase since 1938. This increase is largely due to increased consumption by electrical powerplants. The total smoke production is down, but SO_2 produced by power-generating plants has increased five-fold since 1938 resulting in an increased SO_2 total in spite of reductions in other areas. There is no section in the Clean Air Act of 1956 for SO_2 control except one for chimney heights. The chief British complaint about transportation is the unnecessary black smoke from diesels. It is estimated that by 1976 the amount of smoke emitted will be reduced; SO_2 will not be any greater; and CO and hydrocarbons from exhaust gases will be the same for the country as a whole. In the cities, the situation is such that the traffic could hardly be any worse, so that with main roads bypassing the center of towns, and more efficient engines, there may be an improvement on the busiest streets.##

07977

Conkle, J. R., W. E. Mahnon, J. D. Adams, H. J. Reft, and D. E. Welch

DETAILED STUDY OF CONTAMINANT PRODUCTION IN A SPACE CABIN SIMULATOR AT 760 MM. HG. USAF School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Div., Contract NASA R-09, Prog. 7930, Task 793002, SAM-TR-67-16, 142p., Feb. 1967. 18 refs. (Also: Aerospace Med., 38(5):491-499, May 1967.)

A 27-day experiment designed to determine man's contribution to trace contaminants in a sealed environment was conducted. The test cell used in this experiment was an advanced testing device for simulating manned spacecraft atmospheres. A total of 97 compounds were identified and quantified during the 27 days. Twenty-one compounds were noted only during the manned portion of the study. Direct analysis of the sealed environment was not adequate for this type of comprehensive survey. The use of cryogenic fractionation and concentration, however, did provide samples with sufficient concentration of contaminants for analysis by means of gas chromatography, infrared spectroscopy, and mass spectroscopy. Carbon monoxide was the only compound which was produced by man at such a rate that clearly would require removal in long-term sealed atmospheric system habitation. (Authors' abstract, modified)**

07979

L. G. Austin

FUEL CELLS: A REVIEW OF GOVERNMENT-SPONSORED RESEARCH, 1950-1964. North Carolina State Univ., Raleigh, Dept. of Chemical Engineering, NASA-SP-120, 439 p., 1967.

Fuel-cell investigations funded by Government agencies of the United States of America are reviewed. Primary Navy interest is in more buoyant submarines; Army interest concerns silent frontline power and more efficient use of fuel for motive power. Both services need silent, portable electric generators. The Air Force and NASA share the desire for minimum-weight spacepower systems. The Advanced Research Projects Agency of the Department of Defense considered direct energy conversion important enough to carry multimillion-dollar project Lorraine for several years, which included sizable funds for fuel-cell work. In addition, the Atomic Energy Commission is looking into thermally regenerative fuel cells as possible adjuncts to nuclear power plants. The high fuel efficiency of fuel cells is a major advantage in vehicle propulsion. The fuel efficiency of military vehicles is probably no greater than 15 to 25 percent and a fuel cell unit with an efficiency of 50 percent would have a great impact on the logistics of fuel supply. Only cheap fuels with a high specific energy (Btu/lb or Btu/gal) can be considered. The powerplant must be efficient and capable of (-54 degrees C), and have reasonable weight and size. Electric motors have excellent overload capability and can be run at several times its continuous rated capacity for periods of minutes. Therefore, electric motors probably need only about one-fourth of the nominal rating of gasoline engines; e.g., 20

kilowatts to replace 150 bhp. Power densities of 2kw/cu ft and 2: w/lb for fuel cells have been cited as requirements for vehicle propulsion (assuming 60 percent efficiency), but could be too low by a factor of 3. (o present direct or indirect hydrocarbon fuel cells satisfy these requirements.**

08025

Conkle, James P.

CONTAMINANT STUDIES IN CLOSED ECOLOGICAL SYSTEMS AT THE SCHOOL OF AEROSPACE MEDICINE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 31-50, Dec. 1966. 18 refs.
CFSTI, DDC: AD 646512

A 27-day experiment at 760 mm Hg (oxygen, 20%; nitrogen, 80%) was conducted to define the contaminants associated with human occupancy of a sealed environmental simulator. A second experiment of 56 days duration was performed to evaluate the suitability of a helium (30%) - oxygen (70%) atmosphere at 258 mm Hg. The atmospheres to which the four human subjects were exposed were analyzed for trace contaminants. A total of 105 compounds were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. Carbon monoxide and carbon dioxide were the only compounds which were produced by man at such a rate that clearly would require removal in long-term sealed atmospheric habitation.**

08031

J. V. Pustinger Jr.; and F. H. Hodgson

IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS. Monsanto Research Corp., Dayton, Ohio, Contract AF 33(615) - 3377, Proj. 6302, Task 630202, AMRL-TR-67-58, 164p., June 1967.
CFSTI, DDC: AD 658203

Ninety eight candidate materials for space cabin construction were tested to establish possible volatile gas-off and oxidation products. These materials could be potential cabin contaminants. Test conditions were designed to simulate the normal space cabin environment. After pretreatment at 0.1 torr and at 25 degrees C, candidate materials were stored in bench-scale simulators for 14 days at 60 degrees C, and for 30, 60, and 90 days at 25 degrees C, in a 5 psia oxygen atmosphere with 20-40% relative humidity. Individual components of the volatile contaminants were identified and the quantities evolved were estimated by gas chromatographic and mass spectrometric analyses. Paints and coatings, prepared immediately before testing, gave off considerable amounts of entrapped solvents. Lesser, but significant, amounts of contaminants result from oxidation and from hydrolysis. In some cases, larger increases in carbon monoxide levels were observed when the storage temperature was increased from 25 degrees C to 60 degrees C. In addition to the gas-off experiments, a cryogenic system for serial trapping of atmospheric contaminants was

constructed. Gas chromatographic and mass spectrometric analyses were performed on four samples of atmospheres from bio-environmental systems. (Authors' abstract, modified)**

08165

Nadogibchenko, M. K.

PRESENT DAY CONDITIONS OF ATMOSPHERIC AIR POLLUTION BY AUTOMOBILE EXHAUST GASES IN CITIES AND PROBLEMS OF ITS CONTROL. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by H. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 195-199, May 1960.
CFSTI: TT 60-21475

Air quality measurements in Russian cities indicated that carbon monoxide was the most important automotive exhaust pollutant. In Moscow, maximum concentrations of carbon monoxide reached 100 - 200 mg/cu m; in Leningrad 145 to 155 mg/cu m; in Saratov 20 to 60 mg/cu m; in Perm 40 to 60 mg/cu m, and in Ivanova 18 to 88 mg/cu m. In Sverdlovsk the lead content in the exhaust gases ranged between 0.059 to 1.70 mg/cu m, depending upon the make of the motor vehicle. Investigations in Moscow in connection with the utilization of ethylated gasoline by the passenger auto transport revealed only from 0.001 to 0.001 mg/cu m of lead in the street air. Investigations disclosed in auto transport exhaust gases the presence of a polycyclic hydrocarbon, 3, 4-benzpyrene, generated at the rate of 0.75 mg/min. According to most recent reports auto transport exhaust gases were polluting atmospheric air also with nitrogen oxides; the more incomplete was the gas combustion the greater was the quantity of formed carbon monoxide and less of nitrogen oxides were emitted into the air; vice versa, the more complete the gas combustion the less CO was formed and the more nitrogen oxides were discharged into the air. Next in importance to air pollution with carbon monoxide is air pollution with soot discharged in large quantities with automobile exhaust gases. The cause of this type of atmospheric air pollution lies in the unsatisfactory technical construction and mechanical and functional adjustment of the engines. The reduction of city air pollution caused by auto-transport exhaust gases should be carried out along the following basic lines: Improvement in the design of automobile motors and carburetors with a view to increasing degree of combustion and of gasoline utilization. Development of methods to render harmless exhaust gases emitted by auto-transport engines, preferably by oxidizing them to smaller non-harmful or less harmful molecules.**

08200

Gurinov, S. P.

THE EFFECT OF COMBUSTION METHOD AND OF FUEL TYPE ON THE CONTENT OF 3,4-BENZPYRENE IN SMOKE GLASS. Gigiena i Sanit., 23(12):6-9, 1958. 5 refs. Translated from Russian by H. S. Levine; U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 260-264, Aug. 1960.
CFSTI: TT 60-21913

A study was made to determine the effect of different methods of fuel burning on the content of 3,4-benzpyrene in smoke gases. Methods of burning hard fuel differ in different plants; the pulverized and layer bed methods are examples of fuel burning methods most commonly in practice. Both methods of fuel burning were investigated. Dust samples were collected from boiler room smoke flues by an appropriate aspiration method. Two of the boilers burned coal from the vicinity of Moscow, one burned anthracite, and one burned peat. Analogous investigations in boiler rooms using oil as fuel showed that the process of oil burning liberated the greatest amount of carcinogenic substances. the method of layer or bed burning in non-mechanized furnaces produced considerably greater quantities of 3,4-benzpyrene than in mechanized furnaces; chamber burning of powdered fuel did not produce any carcinogenic substances in smoke discharges. It is recommended that boiler rooms using the bed or layer coal burning method should be equipped with mechanized furnaces; boiler rooms with non-mechanized furnaces should be replaced by central regional boiler rooms and heating centers.

68159

Feuerstein, B. L.; J. F. Thomas, and D. L. Brink

MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR. I. PYROLYSIS AND COMBUSTION ASPECTS. TAPPI, 50(6):258-262, June 1967. 7 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 21-24, 1966.)

The production of malodors is an undesirable side effect that has always been associated with the kraft pulping process. Such malodors may originate at six major points in the overall digestion and combined recovery (inorganic chemical and heat) and organic waste elimination processes. Based on information in the literature, these points may be listed in order of decreasing contribution to atmospheric pollution: the recovery furnace is the major source, followed by evaporators, digester, lime kiln, oxidation tower, and dissolving tank. In the present study it was assumed that the recovery furnace operation covers a wide spectrum, such as distillation and sublimation, pyrolysis, auto-oxidation, stoichiometric combustion, and quenching. It was found possible to carry single charges of spent reaction liquors sequentially through the various steps in the laboratory under controlled conditions as well as to quantitatively collect and analyze all products. The contributions from individual, simultaneously occurring processes within a furnace are thus being considered for the first time from the standpoint of air pollution. Several unique control possibilities have been indicated as a result of this work. Results of the work relating to combustion techniques and sample collection are contained in this paper. Analytical methods and a discussion of the results obtained are presented in the second paper of this series. (Authors' abstract)**

08171

Haug, Fritz and Wolfgang Steinbach

WASTE INCINERATION IN SMALL UNITS. Staub (English translation), 27(7):23-25, July 1967. 10 refs.
CFSTI: TT 67-51408/7

The incinerator investigated has a triple jacket combustion chamber, and is heated up and charged with dry paper waste. The CO and CO2 concentration was recorded by infrared gas analyzers. During charging, CO concentration rose rapidly to 0.4-0.6 vol.% then dropped gradually. CO2 concentration rose rapidly to 1.0 - 1.5 vol. percent, then dropped slowly. The CO and CO2 concentrations were as a rule much lower than with medium units. Measurements to determine the emission of solids were performed with a Strohlein instrument at the chimney end. The results yielded a solid concentration between 300 and 425 mg/ cu m. Large quantities of hydrocarbons were deposited on the measuring filters apart from solids, which gave an impression of a deceptively high dust emission. The strong hydrocarbon development was confirmed by observations and measurements. For a long time white-gray clouds were emitted from the chimney, causing noxious odors in the vicinity.

08176

Fiero, George W.

SOLVENTS, SMOG AND RULE 66. J. Am. Soc. Lubrication Engr., 23(11):448-450, Nov. 1967. 29 refs. (Presented at the 22nd ASLE Annual Meeting, Toronto, Canada, May 1-4, 1967.)

Solvents and cleaners evaporate into the air and some of them may become pollutants. Their quantity, however, is relatively small and their photochemical reactivity is relatively low. Since, however, certain solvents when tested in smog chambers at relatively high concentration (4ppm) do produce eye irritating products, their use is restricted in Los Angeles by Rule 66 and in the San Francisco Bay area by Regulation 3. These are discussed in detail. The topographical and meteorological characteristics of these locations are unique. Therefore, such restrictions should not be imposed in other localities until a thorough study is made to determine the extent, if any, which solvents may contribute to smog.

08190

H. H. Henson, C. L. Tsaros

CONVERSION OF FOSSIL FUELS TO UTILITY GAS. Am. Chem. Soc., Pittsburg, Pa.; Div. Fuel Chem., Preprints, 9(2):108-113, 1965. 9 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 4-9, 1965.)

Natural gas has nearly completely replaced the use of coal as a source of utility gas in the United States. The

production of gas from coal, shale, and distillate and residual oils is discussed in terms of conversion costs. The following processes for converting coal to gas are described in detail: (1) Lurgi gasification, (2) Hydrogasification, (3) Hydrogasification and the steam-iron process. The raw material costs and the plant investments for gas made by these processes are tabulated. Estimates of gas costs averaged for a 20-year period, indicate that with an improvement in coal gasification technology, it would be possible to decrease the cost of utility gas made from coal by $0.43 per thousand cubic feet for a 90 x 10^6 BTU/Day plant. Next is described the process for the conversion of shale oil to gas. This can be accomplished by two means: (1) to hydrogenate the shale directly, (2) to retort the material first and then hydrogenate the shale oil. Process schemes are shown for these routes. The hydrogenation of the oil and the difficulties involved are described. A summary is given of: raw material requirements, plant investments and gas price. This shows that utility gas can be manufactured by the hydrogasification of oil shale at a reasonable cost. The most important process variable influencing the cost of utility gas is the hydrogen/shale ratio.##

06191

A. D. Schlesinger, G. U. Dinneen, S. Katell

CONVERSION OF FOSSIL FUELS TO LIQUID FUELS. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):120-126, 1965. 12 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 6-9, 1965.)

Supplies of crude petroleum and natural gas, although abundant, are not inexhaustible, and provision is being made for the time when our vast coal and oil shale reserves will be called upon to supply a significant quantity of liquid fuels. The approach on coal research has been to continue theoretical and practical studies to reduce costs by improving stages in the process or by developing new processes. Studies were made in the following areas: coal hydrogenation, gas synthesis, oil shale retorting systems, and bituminous sands and other hydrocarbons. A flexible, integrated plant might emphasize production of different fuels or byproducts under different economic conditions and even at different times of the year. To reduce hydrogen requirements, an alternative is the partial conversion of coal whereby most of the hydrogen is utilized as a hydrocarbon product. The char product is used for generating power or making additional hydrogen by gasification. In recent years, oil shale research by the Bureau of Mines has been limited to small scale laboratory studies on refining analysis. The cost of producing gasoline from oil shale is almost competitive with gasoline from petroleum on the West Coast. One of the main problems is the isolated location of major deposits. The recent process developments discussed have added more to refined technology rather than to significant savings in cost. It has been amply demonstrated both in the United States and elsewhere in the world, that liquid fuels can be made from coal. Except in isolated cases, costs are too high for coal

to be a real contender with petroleum at current prices. Only by continued research will the remaining problems be solved.**

08191

John H. Ryan

UTILIZATION OF PETROLEUM AND PETROLEUM PRODUCTS. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):223-230, 1965. 6 refs. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 6-9, 1965.)

In discussing utilization of petroleum, the existing or potential technology of oil consumption must be considered, also the effects of potential changes in supply and of new competitive forces. The demand for petroleum products in the U. S. will probably grow at a rate of 2 or 3 per cent a year. Abroad the annual growth rate will be perhaps twice as great as the rate in the U. S. 50% of all the oil consumed in the U. S. is used in the transportation sector. The growth rate will be limited by the growth of the market. General industry and power plant use constitute a second market, accounting for 7% of steam and electric power plant fuel, and 13% of the manufacturers' heat and power market. Another major market is residential and commercial consumption in which oil supplies about one third of the total energy consumed. Resources will not be a limiting factor either in the U. S. or the free world and there should be no significant shift in relative fuel prices in the foreseeable future. It is unlikely that oil demand will be increased appreciably in the U. S. through research in utilization. Research on improved exploratory and productive techniques will probably have a greater influence on domestic oil demand than will research on oil utilization. The changes in oil utilization which appear most probable will not alter the growth rate of oil demand in the U.S. so much as its composition. Finally, some research is being conducted today on the supposition that crude oil is in limited supply and hence that refined product prices are likely to rise in the near future relative to prices of competing fuels.**

08192

Daniel Parson

GAS UTILIZATION TODAY AND IN THE FUTURE. Am. Chem. Soc., Pittsburg, Pa., Div. Fuel Chem., Preprints, 9(2):231-241, 1965. (Presented at the 149th National Meeting, American Chemical Society, Division of Fuel Chemistry, Symposium on Fuel and Energy Economics, Detroit, Mich., April 6-9, 1965.)

A comprehensive picture is given of the current and future status of gas utilization in the United States. Economic problems which affect all phases of industry, from the wellhead to the consumer, are discussed. The research and technological challenges within the industry are examined.**

08606

Loquercio, Peter

AIR POLLUTION CONTROL FOR SCREW MACHINE OPERATIONS. Factory, 125(9):163-169, Sept. 1967.

Generally there are three major sources of air pollution in screw machine operations: machining, finishing, and heat treating and quenching. The most common sources of pollution are the fumes created when cutting oils, lubricants and coolants break down during machining processes. Metal dust is the most significant pollutant in the finishing--grinding, polishing and buffing--phase. Two types of air pollutants can arise from heat treating; oil vapors from the quenching tanks, and toxic gases emitted from heat-treating furnaces under special atmospheres. Heat treating furnaces are suspected of emitting such toxic pollutants as cyanides, carbon monoxide, nitrogen, methane, and metallic oxides. Control equipment falls into several categories. For "particulates" or solids (metal dust) removal, dry and wet collectors are used. For general gaseous pollutants (oil vapors, toxic emissions), afterburners and absorbers may do the job.**

08696

Marchenko, E. N.

FUNDAMENTAL PROBLEMS OF INDUSTRIAL HYGIENE IN PROCESSING OF POLYFLUOROETHYLENE RESINS. ((Osnovnye voprosy gigieny truda pri pererabotke ftoroplastov.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):12-16, Nov. 1966. 9 refs.

A literature survey is presented on processes involved in the degradation of polyfluoroethylene resins. Studies of operating conditions during heat treatment of polyfluoroethylene showed that the atmosphere may be polluted with perfluoroisobutylene, tetrafluoroethylene, oxyfluorides, hydrogen fluoride, carbon monoxide, and polymer aerosols. A system of prophylactic measures has been developed which drastically reduces toxic air pollution. Heat processing of polyfluoroethylene resins requires the special attention of hygienists and engineers.**

08691

Shoji, Hikaru Takao Yamamoto, Konosuke Nishida, Yoshinori Ishikawa, Samusa Takada, and Kaori Inoue

STUDIES ON AIR POLLUTION OWING TO THE AUTOMOBILE EXHAUST GASES. THE CONCENTRATIONS OF C1-C6 HYDROCARBONS AND SOME INORGANIC GASES IN THE EXHAUST GASES. Text in Japanese. Japan. J. Hyg. (Tokyo), 22(2):341-353, June 1967. 34 refs.

The exhaust of an idling 1959 Datsun was analyzed, using gas chromatography. Fuel consumption rate, air-fuel ratio, exhaust gas temperature, intake air volume, emission gas volume and concentration of the exhausted components were measured under constant conditions (at 600 to 5,000 r.p.m.). Results, which are

tabulated, were as follows: 1) Fuel consumption at 600 r.p.m. was 227 gm./ps. hr. and decreased with increasing revolutions. The volumetric efficiency of intake air-fuel mixtures was very low (31-51%) during idling. The air-fuel ratio was 10.4 at 600 r.p.m., while a lean fuel state was observed when rotation was over 2,500 r.p.m. 2) Temperature of the emitted gases (at the tail pipe) was 60-80 deg C from 600 to 1,500 r.p.m. Temperatures above 300 deg C were recorded at rotations above 4,000. 3) At 600 r.p.m., CO2 content was found to be 2.1%. Maximum CO2 level was observed at 1,000 to 2,000 r.p.m. The maximum concentration of CO (9.9%) was found at 600 r.p.m.; concentration decreased with increasing revolutions (4.4% at 5,000 r.p.m.). These results suggest that exhaust gases containing 10% CO would be discharged into the atmosphere when this car was stopped at an intersection. 4) In the exhaust gases, 25 kinds of short-chain hydrocarbons were identified: 3,645 p.p.m. total were determined at 600 r.p.m. and 689.9 p.p.m. at 4,000 r.p.m. Relatively large proportions (5.5 to 21.7%) were found as methane ethane, n-butane, iso-butane, ethylene, and propylene. 5) The composition of exhaust gases averaged: paraffin, 62%; olefin, 11%; diolefin, 0.4%; and acetylene, 5%. 6) The ratio of the emitted hydrocarbons to fuel was about .10 v/v at 600 r.p.m. and .01 at 4,000 r.p.m. Emission of the hydrocarbons during the idling was 1.79 gm./min. at 600 r.p.m. and 0.94 gm./min. at 1,500 r.p.m.##

08497

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL ENGINES. II. DIESEL ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. II. Dieselmotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(9):644-648, Sept. 1967.

The various pollutants present in the smoke produced by diesel engines were measured and discussed. The results, illustrated in tables and graphs, show that CO emission is only 1/10 that allowed for gasoline engines and is therefore of minor importance. Aldehydes with their characteristic irritating odor are also produced in small quantities and are considered annoying, but medically unimportant. The nitrogen oxides, NO and NO2, are produced in sufficiently large quantities to cause lack of oxygen in the blood, and inflammation of the respiratory tract. The antechamber motor produces fewer nitrogen oxides than the direct injection motor. Amount of SO2 produced is negligible. 3,4-Benzopyrene is emitted in significant quantities when an engine emits a large quantity of smoke and then only if the motor is run under high pressure. As a control measure a reduction in smoke quantity is recommended. The smoke characteristics can also be greatly influenced by the design of the combustion chamber and proper maintenance of the engines.##

08524

Raphael, E. A., L. V. Trofimova, N. A. Evikeeva, and A. K. Monkevich

HYGIENIC EVALUATION OF SOME PETROCHEMICAL INDUSTRIES. ((Gigienicheskaya otsenka nekotorykh neftekhimicheskikh-

kykh proizvodstv.)] Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(11):32-36, Nov. 1966. 10 refs.

Deficiencies in planning and actual operation of petrochemical plants are responsible for the discharge of acetylene, polyethylene, phenol, acetone, methylstyrene, isoprene, divinyl and other toxic complexes which are products of decomposition, oxidation, and hydrolysis. Description of toxic substances from construction materials (concrete brick) plays an important part. The authors recommend methods for improving working conditions in petrochemical production facilities. (Authors' summary, modified)

00551

Coffman, G. R.

SOUTHERN CALIFORNIA AEROSPACE INDUSTRY'S PROGRAM TO CONTROL SMOG PRODUCED BY CHEMICAL MILLING MASKANTS AND SHOP PROTECTIVE COATINGS. S.A.E. (Soc. Automotive Engrs.), Preprint 670816, 10p., 1967. (Presented at the Aeronautic & Space Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

The materials, test criteria results, and conclusions for chemical milling maskants and hand-peelable shop protective coatings which comply with Rule 66 of the Los Angeles County Air Pollution Control District (APCD), and are used by the aerospace industry in Southern California are discussed. The maskants were evaluated to determine the material best suited under Rule 66 to perform chemical milling, and the shop protective coatings were evaluated to determine the material best suited for protecting metal surfaces during fabrication, adhesive bonding, and assembly operations. (Author's abstract, modified)

00557

George, J. C. and G. R. Norris

AVAILABILITY AND EVALUATION OF NONPHOTOCHEMICALLY REACTIVE PRIMERS AND TOPCOATS FOR AEROSPACE APPLICATIONS. S.A.E. (Soc. Automotive Engrs.), Preprint 670814, 7p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

New coatings with low smog producing potential have been and are continuing to be evaluated for use in the aerospace industry. These new coatings have been proved in laboratory and shop testing to be equal in quality to the conventional coatings they are replacing. Environmental exposure tests to date are satisfactory and are continuing. However, difficulty has been encountered in obtaining consistent quality in large production batches. Some of the new coatings contain solvents that are slightly more toxic. Also, some of the modified coatings have lower flash points. These new materials, which include both proprietary and military coatings, appear to be readily available. Coating costs of the new materials generally are higher, but vary from a reduction of approximately 7 percent to an increase of 35 percent. (Author's abstract)

08611

Cleary, Graham J.

AIR POLLUTION AND THE AUTOMOBILE. Clean Air (J. Clean Air Soc. Australia New Zealand) 1(1):7-9,11, June 1967. 18 refs.

The magnitude and nature of the emissions from automobile engines are examined. Most of the pollution is discharged through the tail pipe (about 60 percent on a total hydrocarbon basis), but crankcase emissions (30 percent) are also appreciable. The remaining ten per cent is made up of evaporation losses from the fuel tank and from the carburettor after the engine has stopped. Eye irritation, plant damage and cracking of types rubber have been found in communities heavily polluted by automobile exhaust products. Control measures to minimize pollution are considered. These involve burning the exhaust gases from the tail pipe by means of either thermal or catalytic afterburners, and recycling the vent gases from the crankcase to either the air manifold or the carburettor. Statistics about the current car population in Sydney and the anticipated future growth rate are presented, and an estimate is made of the future date (1990) when the volume of exhaust products in Sydney will be the same as that in Los Angeles in 1943, when conditions of smog were first experienced. (Author's abstract)

08602

Hoffmann, H.

THE COMPOSITION OF EXHAUST GASES FROM DIESEL MOTORS. ((Die Zusammensetzung der Auspuffgase bei Dieselmotoren.)) Text in German. Z. Praeventivmed. Vol. 11, p. 104-121, March-April 1966.

The smoke emission of different types of diesel motors was determined and the results presented in a series of graphs. Under full load little difference in smoke emission was observed between chambered engines and direct injection engines, while the latter were superior under partial load. The various factors in engine development which influence smoke emissions are discussed. The carbon monoxide, aldehyde, and nitrogen oxide content of the exhaust gas was determined and it was found that the CO content is of no concern in diesel motors, since the concentration is not over 0.1-0.15 Vol.% and in many cases below 0.05 Vol.%. The same is true for aldehydes whose odorous annoyance has a psychological but not medical effect at the emitted concentrations. The nitrogen oxide content was found to be higher with direct fuel injection engines. The amount of 3,4-benzopyrene emission is influenced by the fuel composition and the combustion system and is only of concern if the motor is operated under high mean pressure, when as much as 0.5 gamma benzopyrene in 500 liters of exhaust gas was found at 1200-1500 U/min. under 3/4 load. It is concluded that by proper construction and development and particularly by proper care of the engine, the smoke from modern diesel engines can be reduced to an unobjectionable amount.##

00851

Conkle, J. P.; W. E. Mahaon, J. D. Adams, H. J. Zeft, and R. E. Welch

A DETAILED STUDY OF CONTAMINANTS PRODUCED BY MAN IN A SPACE CABIN SIMULATOR AT 760 MM. HG. School of Aerospace Medicine, Brooks AFB, Tex.; Aerospace Medical Div.; Contract NASA-R-99, Proj. 7930, Task 793002, 151p.; March 1967. 18 refs.
CFSTI, DDC: AD 653932

The atmosphere within the space cabin simulator contained 20% oxygen and 80% nitrogen. The study was divided into three parts: a preliminary stabilization period of 3 days; an unmanned background period of 11 days; and a manned period of 15 days. The unmanned portion provided information as to the contaminant materials associated with the test cell, previous occupancy by man, and support items required during the subsequent manned portion. The four volunteer subjects were sustained on a liquid diet and were permitted limited hygienic activity during their occupancy of the test cell. Direct sampling and concentrating technics with subsequent analysis were utilized for contaminant detection. Dual flame-ionization gas chromatography and microwave spectrometry were used for the analysis of unconcentrated samples which were obtained directly from the chamber. Methane and carbon monoxide were analyzed by flame-ionization gas chromatography and infrared spectroscopy, respectively. To concentrate the sample, multistage cryogenic trapping systems were operated daily during the 27-day study. Four sample sets were analyzed daily. Rapid initial increases in methane and carbon monoxide were observed soon after man entered the test cell. The methane concentration increased from 20.9 mg./cu m the day after man entered the chamber to a high of 88.6 mg/cu m. The concentration of carbon monoxide ranged from a low of 4.8 mg./cu m to a high of 21.7 mg./cu m. No significant data relating to organic compounds were obtained from the analyses of unconcentrated samples during either portion of the study. Carbon monoxide and carbon dioxide were identified as compounds which were produced by man at a rate that would require removal in a closed system operation.##

00873

Fryxinger, Galen R.

FUEL CELL-ENERGY STORAGE HYBRID SYSTEMS FOR VEHICLES. Preprint, Army Electronics Command, Fort Monmouth, N. J., Electronic Components Lab., 25 p., 1967.
CFSTI, DDC: AD 662236

So called vehicle battery problems can be overcome through the use of a fuel cell-battery hybrid power source. This power source allows an electric vehicle full range capability, excellent acceleration characteristics, and very fast energy refuel. To achieve such performance for military vehicles, a 150 Whr/lb molten electrolyte battery and a 20-30 lbs./KW hydrocarbon fuel cell must be developed. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years.

09021

Epstein, George and Edward F. Westlake, Jr.

MATERIALS FOR SPACE CABINS: THE FIRE HAZARD AND ATMOSPHERE CONTAMINANT CONTROL PROBLEMS. Aerospace Corp., El Segundo, Calif., Materials Science Lab., Contract F04695-67-C-0158, TR-0158(3250-20)-8, SAMSO-TR-67-76, 27 p., Oct. 1967. 3 refs.
CFSTI: AD 663618

The flammability and atmospheric contaminant hazards associated with the use of plastics and other nonmetallic materials in manned spacecraft cabins are discussed. Outgassing characteristics and mechanisms of typical materials are described. Flammability and combustion rates are discussed as highly important materials selection factors. An approach is presented for minimizing the hazards through judicious selection and batch control of cabin materials. (Authors' abstract, modified)##

09098

AIR POLLUTION -- A SPECIAL REPORT. Power, 68p., ((1967?)).

The results of research on each phase of air pollution are reviewed. The nature of this planet's atmosphere, its natural pollutants and the mechanics of their transport are outlined. The contribution to air pollution made by man as he lives and works is described. The effects of air pollution on man's social and economic existence are examined. Constructive approaches are given to help communities meet the challenge of air pollution control effectively and economically. It is shown how intelligent plant design and location can eliminate pollution problems from the start and then how problems of existing plants can be mitigated.##

09106

Asher, William J., Robert H. Shabaker, and Carl H. Heath

FUEL CELL FUEL STUDIES. (INTERIM TECHNICAL REPORT, 10 JANUARY 1967 - 9 JULY 1967). Esso Research and Engineering Co., Linden, N.J., Government Research Lab., Contract DA-44-009 AMC -1884(T), ITR-3, 65p., 1967. 12 refs.
DDC: AD 823 283

Research and development aimed at processes for field treatment of military fuels to make them suitable for fuel cells have continued. This program is divided into two tasks. Task A is directed to the development of a process for removing components in jet fuel which are harmful to fuel cell performance. Task B is concerned with the feasibility of liquid phase reforming to generate hydrogen fuel. In Task A, removal of naphthenes by dehydrogenation has proved difficult. Molecular sieve absorption processing can remove aromatics and sulfur or sulfur alone at an increase yield. Desorption of the impurities adsorbed on the sieve is the key to this process. A simple carbon dioxide desorption process was ineffective. A new carbon dioxide-air hybrid desorption process has shown promise in simulated operation.

The feasibility study on liquid phase reforming has been continued. High reaction rates equivalent to reforming catalyst requirements of 8 lb/kw with a H2-air fuel cell have been obtained at 600 F using pure n-C12 and n-C15 hydrocarbon feeds. The reaction rates declined with time on stream due to catalyst oxidation in the intermittent once-through experiments. The thermal efficiency of the system depends on the conversion level per pass required for good hydrogen selectivity. Adequate hydrogen selectivity has been obtained at conversion levels 100-fold higher than in the exploratory studies. Carbon monoxide and hydrocarbon fragments remain undetectable.##

09148

Heath, C. E.; E. H. Okrent, H. Beltzer, and G. Ciprios

DIRECT HYDROCARBON AND METHANOL-AIR FUEL CELLS. In: Power Systems for Electric Vehicles. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-37, p. 307-312, 1967. 3 refs. (Presented at the Symposium on Power Systems for Electric Vehicles, New York, N. Y., April 6-8, 1967.)

Research on direct liquid hydrocarbon and methanol-air fuel cells has identified some of the problems that must be solved before fuel cells can meet the specific requirements for an automotive power plant. The question of whether the fuel cell can reduce air pollution cannot be conclusively answered yet. Direct hydrocarbon cells, operating at temperatures below 500 degrees F, appear to offer no serious source of contamination. Studies have shown that hydrocarbons are completely consumed to carbon dioxide and water in sulfuric acid electrolytes at 90 degrees C. Fuel cell fuels will probably be sulfur and lead-free. Furthermore, the low temperatures should minimize nitrogen oxide formation. Hydrocarbon losses from manifolds and tanks may cause a problem, but using low vapor pressure fuels and proper engineering should minimize this contribution. No major obstacles to a low-emission vehicle are known, but clearly much more experience will be required to define pollution levels in operative systems. The present state of hydrocarbon fuel cell technology cannot meet the requirements of a high-output, low-cost system suitable for extensive vehicular application. Much progress has been made during the past five years. If this progress continues and suitable catalysts are developed, a fuel-cell-powered vehicle could become practical. However, much more research and development will be needed before this stage is reached.##

09224

McDonald, James E.

VISIBILITY REDUCTION DUE TO JET-EXHAUST CARBON PARTICLES. J. Appl. Meteorol., 1(3):391-390, Sept. 1962. 15 refs.

Pyrolysis of hydrocarbon fuels leads to emission of free carbon in the exhaust of aircraft turbojet engines, visible as a faint dark trail. Carbon formation rises markedly when water injection is employed to augment thrust by 20-30 per cent in takeoffs under

heavy loads or at high temperatures, the enhanced pyrolysis resulting from the lower combustion efficiency on such wet takeoffs. During the takeoff run, while the aircraft is still moving at low speeds but with maximum thrust, dense dark smoke fills the exhaust wake, reducing visual ranges to as little as a few hundred feet. To cross-check recent measurements indicating carbon particulate emissions of the order of 15 lb per ton of fuel consumed in wet takeoff, mie extinction coefficients have been computed for carbon particles of the size known to form as a sequel to pyrolytic freeing of carbon. These are used to make theoretical estimates of the maximum visual range to be expected if the carbon loading measurements were correct. A discrepancy exists in the sense that the predicted visual ranges are found to be some five times larger than the observed. It is concluded that a large fraction of total carbon emission leaves the tailpipe still unaggregated into large soot particles, whence the reported carbon loadings may be too low by a factor of as much as five. Consequently the aircraft operational hazards as well as the air pollution problems implicit in rising volume of jet traffic at certain terminals may become rather more serious than has been predicted. (Author's abstract)

09131

Miles L. Brubacher, Eric P. Grant

DO EXHAUST CONTROLS REALLY WORK? - SECOND REPORT. Preprint, Society of Automotive Engineers, 10p., 1968. 12 refs (Presented at the West Coast Meeting of the Society of Automotive Engineers, Portland, Oregon, Aug. 14-17, 1967, Paper 670889.)

Emission tests on 739 cars (1966 and 1967 models) equipped with exhaust controls in public use confirm that the vehicle manufacturers have done a good job of designing cars with low emissions. However, field data on emissions higher than proving ground results, and deterioration of emissions with mileage, indicate that much more effort is needed with regard to proper engine adjustments and quality control on the production line as well as better servicing of the engines in the field. Continued effective emission control after initial sale of the new car is the responsibility of the states. (Authors' abstract) ##

09141

Oberdorfer, P. E.

THE DETERMINATION OF ALDEHYDES IN AUTOMOBILE EXHAUST GAS. Preprint, Society of Automotive Engineers, 10p., 1967. 14 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670123.)

A method for the sampling and determination of exhaust aldehydes and ketones is described. The procedure consists of absorbing and converting these compounds to the solid 2,4 di-nitrophenylhydrazone derivatives. Results are reported as total aldehydes and/or the derivatives separated into individual, identifiable components by chromatographic techniques. Exhaust emission data employing this procedure are presented for a limited

number of vehicles with and without exhaust control systems. Total aldehyde levels (as formaldehyde) were found to range from about 20 to over several hundred parts per million depending on the mode of operation and the adjustment of such variables as air-fuel ratio, spark timing, and exhaust emission control devices. Effects of these variables on aldehyde emissions are discussed. The relationship of the chemical structure of inducted fuel to aldehyde emissions is also touched upon. The amount of individual aldehydes was found to be related to the parent fuel to a considerable extent for pure individual hydrocarbon fuels. This relationship is greatly diminished, however, within the design limitations of current full boiling practical gasolines. (Author's abstract)##

09147

D. T. Wade

FACTORS INFLUENCING VEHICLE EVAPORATIVE EMISSIONS. Preprint, Society of Automotive Engineers, 11p., 1967. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670126.)

The basic factors influencing carburetor and fuel tank evaporative emissions are explored. These factors are combined in a mathematical model to predict the magnitude and composition of evaporative losses. A laboratory technique for simulating carburetor losses is also described. The behavior of fuel in the carburetor bowl during a short soak is adequately simulated by a one plate equilibrium distillation. Factors influencing carburetor hot soak losses are: maximum bowl temperature; bowl volume (including after-supply); and fuel temperature distillation curve from one plate equilibrium distillation. Both quantity and composition of carburetor losses can be calculated from the following: original fuel composition, maximum bowl temperature, effective bowl volume. Fuel tank losses occur because of tank temperature increases which cause an increase in fuel vapor pressure and thermal expansion of the tank vapor. Factors influencing fuel tank losses are: tank temperature; vapor volume; tank pressure; rate of equilibration of liquid and vapor; fuel vapor pressure; molecular weight; and density. If equilibrium between liquid and vapor exists, tank losses can be calculated from a knowledge of the following: tank temperatures, vapor volume, tank pressure, fuel vapor pressure, fuel density, and molecular weight of fuel vapor.

09155

Pahnke, Aiden J. and Edward C. Squire

LEAD IN GASOLINE: NO EFFECT ON EXHAUST EMISSIONS FOUND IN 18-MONTH CONSUMER-CAR TEST. Oil Gas J., 64(50):108-110, Dec. 12, 1966.

Use of tetraethyl lead in gasoline does not significantly affect exhaust emission characteristics of vehicles driven by the motoring public. This is the conclusion reached after a test of leaded and unleaded gasoline in 122 privately owned and operated cars spanning a period of 18 months and covering a total of 2,500,000 miles. Carbon monoxide and hydrocarbon-emission

levels of the cars operated on leaded gasoline were essentially equivalent to those of the cars driven on unleaded gasoline. Photochemical reactivity and nitrogen oxide levels for the two car groups were also equivalent, further demonstrating the absence of any effects of tetraethyl lead on vehicle emissions either positive or negative.##

09185

Viroli, G. and E. Fratte

AIR POLLUTION FROM ROOMS HEATED BY STOVES USING "LIQUID GAS". (Sulla corruzione dell'aria degli ambienti riscaldati da stufe a gas liquido.) Text in Italian. Riv. Ital. 'Igiene (Pisa), 26(1-2):113-128, Jan.-April 1966. 26 refs.

The use of liquid-gas fuel in stoves causes the accumulation of CO, CO2 and aliphatic hydrocarbons indoors. Measurements were made in two rooms, 93 sq. m. and 166 sq. m. on 6 different types of gas stoves, two of them open flame. Gas chromatography and the Fractovap D apparatus were utilized. Data for the levels of CO2, CO, and hydrocarbons liberated by combustion are tabulated. CO levels ranged from traces to 130 p.p.m. After 2-4 hours of burning, the amount of CO2 in the room from open flame ovens was 5 percent or more, and , after 8 hours, up to 15.24 percent. The effect of this type of indoor heating on pollution of the ambient (outside) air is well below the limit considered toxic by present standards, but increased use of such equipment would eventually lead to considerable air pollution.

09189

Valori, P. A. Orsilia, C. Melchiorri, and N. Vescia

SPECTROPHOTOMETRIC DETERMINATION OF AROMATIC POLYCYCLIC HYDROCARBONS. FURTHER DATA ON THE ATMOSPHERE OF ROME. (La determinazione spettrofotometrica degli idrocarburi policiclici aromatici. Ulteriori rilievi nell'atmosfera di Roma.) Text in Italian. Nuovi Ann. 'Igiene Microbiol. (Rome), 17(5):393-419, Sept.-Oct. 1966. 23 refs.

From Jan. 1965 to March 1966, samples of polluted air, taken three times a day, were analysed spectrophotometrically after column chromatography. The minimum and maximum values micrograms/100 cu. m. of air) were: phenanthrene, 0.41-1.12; anthracene, 0.12-0.22; pyrene, 2.40-4.62; fluoranthene, 2.10-4.92; chrysene, 2.50-3.03; 1,2-benzanthracene, 1.10-3.09; perylene, 0.25-0.60; 3,4-benzpyrene, 2.00-5.20; 1,12-benzperylene, 1.40-3.75; anthanthrene, 0.44-0.80; and coronene, 0.60-1.00. The highest levels were observed during the winter months in morning rush hours and are due to domestic heating and automotive traffic.

09191

Hattche, O.

AIR POLLUTION IN LOCALITIES WITH HEAVY TRAFFIC IN METROPOLITAN CITIES. ((Die Verunreinigung der Atmosphare an

verkehrsreichen Punkten in Grossstadten.[] Text in German. Z. Praeventivmed. 11(2):122-131, March-April 1966. 27 refs.

Data on the variations in time of CO, SO2, NO, NO2, hydrocarbons, polycyclic hydrocarbons, lead compounds and dust in various European cities such as Stuttgart, Frankfurt, Hamburg, Essen and London are discussed and compared with data from Los Angeles. In heavy traffic, concentrations of up to 20 mg. CO, 0.2 mg. NO, 0.1 mg. NO2, 0.05-0.4 mg SO2, 2-10 mg. hydrocarbons and 9 micrograms of lead per cubic meter were found. Polycyclic hydrocarbons such as benzpyrene and coronene can be determined accurately only in tunnels by analysis of the intake air and the air in the tunnel. In Germany, more diesel engines are in operation than the 0.3 percent in Los Angeles. Diesels generate only about 1 percent CO but maintenance must be frequent and soot emission must be controlled. Two-cycle engines give a very low CO emission. Methods used in Germany for the determination of pollutants are outlined. Standardization of analytical methods is emphasized.

09405

Candeli, A., G. Barboni, and G. Bertoli Galeforo

CARCINOGENICITY OF POLLUTED AIR. I. ANALYSIS OF EXHAUST GAS FROM A COMBUSTION ENGINE. [I] problems della cancerogenicita dell'aria inquinata. I. Analisi dei gas di scarico dei motori a scoppio.[] Text in Italian. Riv. Ital. Igiene (Pisa), 26(5-6):438-453, Sept.-Dec. 1966. 25 refs.

Study was made of the amounts of polycyclic aromatic hydrocarbons exhausted from an Italian automobile which ran in neutral for two hours on one liter of the most common commercial gasoline. A filter was attached to the exhaust system and 0.3771 gm. of particulate matter extracted from 112 cm of exhaust. The extract was found to contain anthracene, fluoranthene, pyrene (703 micrograms), coronene (612 micrograms), 1,2-benzanthracene (381 micrograms, 1,2-benzpyrene, 3,4-benzpyrene (52 micrograms), and a new unidentified substance called "compound 409". The extracts, obtained with acetone, were chromatographed on an alumina column and the eluates examined spectrophotometrically. Emphasis is put upon the high level of 3,4-benzpyrene, a notorious carcinogenic agent.##

09421

Keller, J. L. and Joseph Byrne

WHAT VALUE FRONT-END VOLATILITY? Proc. Am. Petrol. Inst., Vol. 46, p. 407-426, 1966. 18 refs. (Presented at the 31st Midyear Meeting of the American Petroleum Institute's Division of Refining, Houston, Texas, May 11, 1966.)

Detailed estimates of the vapor lost from California cars for several potential control methods, along with corresponding estimates of fuel-associated costs, are presented. Factors considered include tank and carburetor vapor loss, vehicle performance and fuel economy, diversion of volatile hydrocarbons to alternate uses, crude oil consumption, and investment and operating costs of alternate refining processes. It is estimated that the

average car in California loses 1.7 percent of its fuel by evaporation and that nearly half the loss could be eliminated by a general reduction of 1 lb in Reid vapor pressure. However, fuel consumption at equal warm-up performance would increase three times as much as vapor loss decreased, adding more air pollutants to the exhaust of pre-1966 cars than would be saved. Total fuel cost would increase $5 dollars over the life of a car. A capital investment of approximately 2 billion dollars would be required of the U.S. petroleum industry to reduce volatility to this extent. Alternately, a lossproof fuel system, for which one possible arrangement is suggested, offers the possibility of eliminating substantially all vapor emissions with no penalty in fuel consumption, and a net reduction of 41 dollars in fuel costs per car, or 127 dollars lower cost than with reduced volatility. If such a fuel system permitted a general increase in volatility equivalent to 1 lb Rvp, achieved gradually over enough years to retire present cars, not only would vapor loss be eliminated but fuel consumption would decrease 6.5 percent and total fuel costs would increase by an estimated $220 per car.

09655

Major, William D.

VARIATIONS IN PULPING PRACTICES WHICH MAY EFFECT EMISSIONS. In: Proceedings of the International Conference on Atmospheric Emissions from Sulfate Pulping, Sanibel Island, Fla., April 28, 1966. E. R. Hendrickson (ed.), Sponsored by: Public Health Service, National Council for Stream Improvement, and University of Florida, DeLand, Fla., E. O. Painter Printing Co., ((1966)), p. 265-281. 8 refs.

Emissions from a kraft mill can be divided into two categories, gaseous and particulate. Malodorous emissions are subject to far less control and precision of analysis than particulate emissions. The magnitude of loss is more sensitive to operating variables, the chemistry is more complicated and the sources are more numerous. This discussion is concerned with the effect of operating variables on gaseous sulfur losses. Evidence is given which indicates that the wood species has a definite effect on the odor produced during kraft pulping. Cooking variables include: sulfidity of the white liquor, cooking time and cooking temperature. More recent cooking variables are: continuous vs. batch digestion, and the use of black liquor dilution in the digester as a means of controlling the liquor-to-wood ratio. Multiple-effect evaporators are the second largest source of gaseous sulfur losses in the process. The high vacuums set up by condensers result in the release of low vapor pressure sulfur compounds. Operating variables in direct contact evaporation are: black liquor pH, sodium sulfide concentration, and per cent CO_2 in the flue gas. Dust losses from the recovery furnace are controlled with either a venturi scrubber or an electrostatic precipitator. Operating variables which influence the efficiencies of these two units are overloading, and the temperature of the flue gas. The key to the effect of operating variables on emissions from a kraft pulp mill is to recognize the degree to which the various steps in the kraft process are interrelated, especially in the case of gaseous sulfur losses.

09737

Oswalins, G. and C. Rehmann

AIR POLLUTANT EMISSION INVENTORY OF NORTHWEST INDIANA. (A PRELIMINARY SURVEY, 1966.) Public Health Service, Durham, N. C., National Center for Air Pollution Control, APTD-68-4, 36p., April 1968.

Sources of air pollutant emissions were surveyed to quantify the total pollution load emitted to the air over the Northwest Indiana communities of East Chicago, Gary, Hammond, and Whiting. The emissions are reported on an annual basis and subdivided into the five major pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. The four major source categories that were utilized in reporting emissions from area and point sources are: fuel combustion in stationary sources, fuel combustion in mobile sources, combustion of refuse, and industrial process losses. The results of this survey are reported by city and illustrated on the grid system established by the Northwest Indiana Air Resource Management Program. (Authors' abstract)

09751

Schaertsing, Hannibal and Julian H. Chaudet

UTILISATION OF INFRARED SPECTROPHOTOMETRY IN MICROCONTAMINANT STUDIES IN SEALED ENVIRONMENTS. Melpar, Inc., Falls Church, Va., Contract AF 41(609)-1962, Task 7930D2, SAM-TR-67-2, 30 p., Jan. 1967.
CFSTI, DDC: AD 650000

Microcontaminants in a sealed environmental system were separated and identified. The separation and identification of the collected samples were accomplished with gas-liquid chromatography and infrared spectrophotometry. Fifty-four sets of samples of the atmosphere from a space cabin simulator, comprising 162 individual samples, were analyzed. The method used was gas-liquid chromatography using a flame ionization detector. The retention time on the column was used for identification, while the peak area was used for quantitative estimation of the compounds. A collection of the vapor infrared spectra of 148 compounds, which are possible contaminants for space cabin simulators, has been compiled during 2 years. A computer program for sorting infrared spectra with the aid of the ASTM deck of infrared cards has been established. Analyses have been made of gases evolved from paint panels, from the decomposition of a Teflon insulator, and from human waste products.

09762

Beaver, Hugh

COMMITTEE ON AIR POLLUTION: REPORT. London, Her Majesty's Stationery Office, 1960, 80p. (Presented to Parliament by the Minister of Housing and Local Government, the Secretary of State for Scotland and the Minister of Fuel and Power by Command of Her Majesty, Nov. 1958.)

A committee on air pollution was established to examine the nature, causes, and effects of air pollution and the efficacy of present preventive measures; to consider what further preventive measures were practicable; and to make recommendations. The report of the committee examined current emission sources of pollutants, the effects of air pollution on health, and the legislation and administration of air pollution. Some recommendations made by the committee were: prohibition of emission of dark smoke from chimneys; arresting plant for grit and dust obligatory in new industrial installations; control of smoke from railways; establishment of smokeless zones and smoke control areas; provisions of financial assistance by local authorities; requirement of local authorities to submit annual reports on progress of smoke abatement; preparation of documents on codes of practice and standards; clean air should be national policy; establishment of a "Clean Air Council" to coordinate and encourage research work.

09759

Sharpe, L. S.

ENERGY SOURCES AND POLICIES, THEIR IMPACT ON AIR POLLUTION, CURRENT AND PROJECTED. Public Health Service, Washington, D. C., Bureau of Disease Prevention and Environmental Control, Contract PH-86-67-69, (132?)p., April 15, 1967. (176) refs.

There have been a number of energy studies over the last 15 - 20 years that have attempted to project the national energy needs to various dates in the future. This study compiles energy projections and the "mix" of energy sources to the year 2000, made as recently as 1967, and, on the basis of these data: estimates the atmospheric pollution burden to be expected by the years 1980 and 2000 provided present fuel policies remain essentially unchanged; summarizes some of the major technological developments that could have an impact on energy source selection and total energy requirements; identifies and discusses some of the major government policies that affect both fuel source and energy demand; outlines some approaches to an evaluation on a benefit/cost basis of alternative policies that would reduce atmospheric pollution and completes the analysis for the solvent refined coal process.

09761

Environmental Science Services Corp., Stamford, Conn.

SOLVENT EMISSION CONTROL LAWS AND THE COATINGS AND SOLVENTS INDUSTRY. (A TECHNO/ECONOMIC STUDY.) 56 p., ((1967)). 6 refs.

The widespread adoption of the strict California solvent emission laws will seriously effect practices and products in the surface coating industry. The California codes contain three main elements: the emission of photochemically reactive solvents is restricted; the sale of coatings containing these materials is banned; and the emission of these materials during the manufacture of coating materials is restricted. Widespread adoption of these codes would cause changes in the formulation of the coatings, and would adversely affect the markets for mineral spirits, naphtha, substituted aromatics, branched ketones, olefins, and trichloroethylene. However, alcohols, esters, odorless mineral

spirits, and glycolesters would gain markets at the expense of the photochemically active solvents. Emission control methods, analytical techniques, and measurement methods are outlined. The effectiveness of various organic solvents in photochemical smog formation is discussed. An evaluation of existing regulations, with emphasis on California Rule 66, is presented along with lists of exempt sources.

09788

Danielson, John A. (comp. and ed.)

AIR POLLUTION ENGINEERING MANUAL. (AIR POLLUTION CONTROL DISTRICT, COUNTY OF LOS ANGELES.) Public Health Service, Cincinnati, National Center for Air Pollution Control, PHS-Pub-999-AP-40, 999-AP-40, 892p.; 1967. ((318)) refs.
GPO: 806-818-30

The control of air pollution at individual sources peculiar to the Los Angeles area is considered. The practical engineering problems of design and operation for many sources of air pollution are emphasized. There are 11 chapters, each by different authors, and 4 appendixes. The chapter titles are: (1) Introduction; (2) Contaminants; (3) Design of Local Exhaust Systems; (4) Air Pollution Control Equipment for Particulate Matter; (5) Control Equipment for Gases and Vapors; (6) Metallurgical Equipment; (7) Control Equipment; (8) Incineration; (9) Combustion Equipment; (10) Petroleum Equipment; and (11) Chemical Processing Equipment. The introduction discusses the Los Angeles Basin, rules and regulations in Los Angeles County, and the use of the manual. The appendixes' titles are: (A) Rules and Regulations; (B) Odor-Testing Techniques; (C) Hypothetical Available Heats from Natural Gas; and (D) Miscellaneous Data.

09789

Dickinson, Janet, Robert L. Chass, and W. J. Hanning

AIR CONTAMINANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 11-21, 1967.
GPO: 806-818-30

The parameters of an air pollution problem, particularly the problem in Los Angeles County; the measures taken to eliminate the problem; and control measures still needed are described. The air contaminants include: organic gases (hydrocarbons, hydrocarbon derivatives); inorganic gases (NO_x, SO_x, CO); miscellaneous inorganic gases (NH_3, H_2S, Cl_2, F_2); particulates (carbon or soot particles, metallic oxides and salts, oily or tarry droplets, acid droplets, metallic fumes). Each is discussed indicating the sources and significance in the air pollution problem.

09801

Thomas, G.

CORE OVENS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999AP-40, p. 309-315, 1967.
GPO: 806-614-30

Various types of core ovens are described. These include the shelf, drawer, portable-rack, car, and conveyor ovens. Heating core ovens, core binders, air contaminants from core ovens, and control methods are discussed. In foundries, core ovens are used to bake the core used in sand molds. Most cores contain binders that require baking to develop the strength needed to resist erosion and deformation by metal during the filling of the mold. Core ovens supply the heat and, where necessary, the oxygen necessary for the baking. Generally, emissions from core ovens are a minor source of air pollution when compared with other metallurgical processes. The air contaminants discharged from core ovens consist of organic acids, aldehydes, hydrocarbon vapors, and smoke. Most core ovens are vented directly to the atmosphere through a stack. Occasionally more than one vent is used, but if emissions are such that air pollution control is needed, then ducting the vents to a control device is all that is necessary. The use of hoods or of excess air is not necessary to capture the emissions. When operated below 400 degrees F and when fired with natural gas, most core ovens do not require air pollution control equipment. Excessive emissions from core ovens have been reduced to tolerable amounts by modifying the composition of the core binders and lowering the baking temperature. When it is not feasible or possible to reduce excessive emissions by modifying the core mix or the baking temperature, afterburners are the only control devices that have proved effective.##

09818

Weiss, Sanford H.

SURFACE-COATING OPERATIONS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 387-390, 1967.
GPO: 806-614-30

Basic coating operations include dipping, spraying, flowcoating, and roller coating. Each operation is described. Air pollution problems, hooding and ventilation requirements, and control equipment are discussed. The discharge from a paint spray booth consists of particulate matter and organic-solvent vapors. Air contaminants from paint dipping, flowcoating, and roller coating exist only in the form of organic-solvent vapors since no particulate matter is formed. The usual spray booth ventilation rate is 100 to 150 fpm per square foot of booth opening. Insurance standards require that the enclosure for spraying operations be designed and maintained so that the average velocity over the face

of the booth, during spraying operations, is not less than 100 fpm. Dip tanks, flowcoaters, and roller coaters are frequently operated without hoods. When local ventilation at the unit is desirable, a canopy hood may be installed. Particulate matter in paint spray booths is controlled by baffle plates, filter pads, or water spray curtains. Known solvent recovery processes make use of condensation, compression, absorption, distillation, or adsorption principles. In view of the small solvent vapor concentration in the airstream from the spray booth or applicator hood, the only economically feasible solvent control method is adsorption. Recent work indicates that adsorption by activated carbon can be a feasible method for the control of paint solvents. This work indicates that control efficiencies of 90 percent or greater are possible, provided particulates are removed from the contaminated airstream by filtration before the airstream enters the carbon bed.

09820

Bailor, William C.

DRY CLEANING EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 191-197, 1967.
GPO: 806-814-30

Dry cleaning equipment follows two basic designs, one design is tailored for petroleum solvents, and the other, for chlorinated hydrocarbon, or synthetic, solvents. In a petroleum solvent dry cleaning plant, the equipment generally includes a washer, centrifuge, tumbler, filter, and, in many instances, a batch still. With perchloroethylene, the washer and extractor are combined in a single unit. The tumbler is equipped with a condenser for recovery of solvent vapor. The tumbler is a closed system while in operation and is vented to the atmosphere only during a short deodorizing period. A muck cooker is often used to reclaim solvent from filter sludge. The dry cleaning industry contributes to air pollution by the release of organic-solvent vapors to the atmosphere. The lint generated when fabrics are tumbled dry is controlled by devices not normally considered to be air pollution control equipment. The synthetic-solvent tumblers are provided with a cloth bag to filter the lint from the exhaust air. Because of safety requirements, hooding and ducting are an integral part of all dry cleaning equipment. In synthetic-solvent plants, vents are provided near the doors of the washer-extractor and the tumbler. An exhaust system is automatically activated whenever these doors are opened, and the system exhausts the vapors resulting from transfer of the wet textiles. When a carbon adsorption unit is used to collect the perchloroethylene vapors, floor vents are also provided to capture vapors from other areas. Activated-carbon adsorption can also be adapted to control the solvent emissions from the petroleum solvent dry cleaning plant, but the lower value of the recovered solvent requires a much longer period of time to pay the cost of the equipment. Other methods of reducing emissions from dry cleaning plants include operational procedures and equipment maintenance.

09825

Hetsley, Arthur B. and John E. Williamson

MULTIPLE-CHAMBER INCINERATORS FOR BURNING WOOD WASTE. In: Air Pollution Main
Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 436-447, 1967.
GPO: 806-614-30

Air pollution from the burning of wood waste can be reduced to a minimum through the use of multiple-chamber incinerators. By promoting complete combustion, multiple-chamber incinerators produce considerably less air pollution than is emitted from single-chamber incinerators or by open burning. The design of multiple-chamber incinerators to burn all forms of wood waste--from large pieces of lumber to sawdust particles that may comprise from 10 to 100 percent of the total weight of the charge is discussed. The designs of mechanical feed systems are also included since the feed system must be properly integrated with the design of the incinerator to promote maximum combustion. An illustrative problem shows calculations involved in designing a multiple-chamber incinerator with a mechanical feed system. The calculations in this problem fall into three general categories: (1) combustion calculations based upon refuse composition, projected air requirements, and heat transfer; (2) gaseous flow calculations based upon the products of combustion at elevated temperatures; and (3) dimensional calculations based upon equations determined empirically from source testing.

09830

Hetsley, Arthur B.

WIRE RECLAMATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 495-503, 1967.
GPO: 806-614-30

Scrap copper wire, with a diameter in the range 18 gage to one inch, which has combustible insulation is reclaimed by burning off the insulation in an incinerator. A great variety of materials composing the combustible insulation: rubber, paper, cotton, silk, and plastics such as polyethylene and polyvinyl chloride. Moreover, the wire itself may have a baked-on coating of plastics, paint, or varnish. As received for burning, the total combustible content of the insulated wire may vary widely from several percent to over 50 percent by weight. Most commercial wire contains from 20 to 35 percent insulation. Burning in the open is accompanied by copious quantities of dense smoke, disagreeable odors, inorganic materials, and oxygenated hydrocarbons. Burning in single-chamber incinerators produces somewhat less smoke, odors, and other air contaminants than open burning does, since combustion air can be regulated. The only practical industrial equipment available today for controlling emissions from single-chamber insulation-burning

incinerators is an afterburner or secondary combustion chamber. The composition of stack gases from equipment with and without afterburners is presented. Design considerations, materials of construction, and operating procedures are discussed and illustrated.

09815

Walters, Donald F.

WASTE-GAS DISPOSAL SYSTEMS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 565-606, 1967.
GPO: 806-614-30

Petroleum refineries must dispose of large quantities of hydrocarbon vent, vapor, blowdown, and emergency pressure release gases. Types, design, instrumentation, and operating practices for gas disposal flares are presented. These include elevated and ground level flares, burner design, steam injection, ignition and pilot light systems, flare sizes and capacities, removal of entrained mists, and provision for emergency overloads. Pressure relief systems are also thoroughly discussed. Commonly used terms dealing with relief systems are defined. Design methods and operating procedures for safety valves (standard and balanced), rupture discs, vent lines, vent headers, and vent gas scrubbers are discussed and illustrated.

09818

Cuffe, Stanley T.

CATALYST REGENERATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 643-653, 1967.
GPO: 806-614-30

The regeneration of catalysts employed in petroleum refining processes, such as fluid and Thermofor catalytic cracking, is accomplished by burning coke and sulfur deposits from the catalyst surface. Combustion gases from regeneration include the pollutants CO, SOx, NOx, NH3, hydrocarbons, and particulate matter. Tables of data collected in 1956 are presented which specify process flow rates, catalyst circulation rates, regenerator air rates, coke burn-off rates, flue gas temperatures, particulate losses, hydrocarbon emission and analysis, and stack gas composition and volumes. Pollution control methods presented and discussed are: wet and dry cyclones, carbon monoxide waste heat boilers, and electrical precipitators. The economy of a CO boiler depends on the catalyst regenerator flue gas volume, temperature, fuel value, and CO2/CO ratio. An analysis of flue gases from CO waste heat boilers is presented for cases where ammonia has and has not been injected into the gas stream before the electrostatic precipitator.

09839

Rinsey, Robert H.

OIL-WATER EFFLUENT SYSTEMS. In: Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.); Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 652-659 1967.
GPO: 806-614-

Oil-water effluent systems found in the petroleum industry collect and separate wastes recover valuable oils, and remove undesirable contaminants before discharge of the water to ocean, rivers, or channels. The type of liquid wastes may be classified as waste water with: Oil present as free oil, emulsified oil, or as oil coating on suspended matter; and chemicals include acids, alkalies, phenols, sulfur compounds, clay, and others. The oil-water separator design must provide for efficient inlet construction, sediment collection mechanisms, and oil skimmers. Clarification of final-effluent water streams is accomplished by filtration, chemical flocculation, and biological treatment. The most objectionable contaminants emitted from liquid waste streams are hydrocarbons, sulfur compounds, and other malodorous materials. The method presented may be used to estimate the hydrocarbon loss from oil-water separators. The most effective means of control of hydrocarbon emissions from oil-water separators has been the covering of forebays or primary separator sections with fixed roofs or floating roofs. Isolation of certain odor-and chemical-bearing liquid wastes at their source for treatment before discharge of the water to the refinery waste-water gathering system is an effective and economical means of minimizing odor and chemicals problems. Principal streams that are treated separately are oil-in-water emulsions, sulfur-bearing waters, acid sludge, and spent caustic wastes. Gravity-type oil-water separators are ineffective in breaking the oil-in-water emulsions. Both ods of separation include direct application of heat, distillation, centrifuging, filtration, use of an electric field coagulating chemicals, air flotation systems, and biological treatment. Sulfide -and mercaptan-bearing water may be steam stripped, or the sulfides may be oxidized to form acceptable thiosulfates, will produce H. S. Acid sludge is dumped, burned, or processed to recover acid or to produce byproduct. Spent caustic wastes are generally dumped, or can be used in the neutralization of acid wastes.

09840

Rinsey, R. H.

PUMPS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.); Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 659-665, 1967.
GPO: 816-614-10

Pumps are used in every phase of the petroleum industry and are available in wide variety of models, sizes, capacities and materials used for construction. All the common machinable metals and alloys, as well as plastics, rubber, and ceramics,

are used. Pumps may be classified under two general headings, positive displacement and centrifugal. Positive-displacement pumps have as their principle of operation the displacement of the liquid from the pump case by reciprocating action of a piston or diaphragm, or rotating action of a gear, cam, vane, or screw. Centrifugal pumps operated by the principle of converting velocity pressure generated by centrifugal force to static pressure. Velocity is imparted to the fluid by an impeller that is rotated at high speeds. The fluid enters at the center of the impeller that is rotated at high speeds. The fluid enters of the impeller and is discharged from its periphery. Power for driving the various types of pumps is usually derived from electric motors, internal combustion engines, or steam driven. Any leak in the pumping equipment causes emission of hydrocarbon vapors and malodorous sulfur compounds. Several means have been devised for sealing the annular clearance between pump shafts and fluid casings to retard leakage. For most refinery applications, packed seals and mechanical seals are widely used. Typical packed seal generally consist of a stuffing box filled with sealing material that encases the moving shaft. Lubrication of the contact surfaces of the packing and shaft is effected by a controlled amount of product leakage to the atmosphere. The second commonly used means of sealing is the mechanical seal. This type of seal can be used only in pump that have a rotary shaft motion. A simple mechanical seal consists of two rings with wearing surfaces at right angles to the shaft. One ring is stationary while the other is attached to the shaft and rotates with it. A spring and the action of fluid pressure keep the two faces in contact. Lubrication of the wearing faces is effected by a thin film of the material being pumped. The wearing faces are precisely finished to ensure perfectly flat surfaces. For cases not feasible to control with mechanical seals, specialized types of pumps, such as canned, diaphragm, or electromagnetic, are required. A pressure-seal-type application can reduce packing gland leakage. A liquid, less volatile or dangerous than the product being pumped, is introduced between two sets of packing at a higher pressure than the product. Volatile vapors that leak past a main seal may be vented to vapor recovery by using dual

09857

D'Esperio, Joseph

OIL AND SOLVENT RE-REFINING. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 799-801, 1967.
GPO: 806-615-10

Used lubricants, hydraulic fluids, and solvents are purified to produce usable products by re-refining techniques. Because the profit margin is small there is very little effort or money spent on pollution control in re-refining plants. Odors and hydrocarbon vapors are frequently released without control. A simple control technique is to enclose all emission sources and incinerate the exhaust gasses in boiler firehoses.

10044

Starkman, E. S., G. B. Jones, and H. F. Newhall

AMMONIA AS A DIESEL ENGINE FUEL: THEORY AND APPLICATION. Society of Automotive Engineers, Preprint, 20p., 1967. 8 refs (Presented at the Combined Fuels and Lubricants, Powerplant and Transportation Meetings, Pittsburgh, Pa., Oct. 30-Nov. 3, portation Meetings, Pittsburgh, Pa., Oct. 30-Nov. 3, 1967. 1967. Paper 670946.)

Theoretical and experimental investigations were carried out for the purpose of predicting and measuring the performance which results from operating of compression ignition engines when anhydrous ammonia is used rather than diesel fuel. Predictions were that ammonia would give slightly increased ouput but that fuel consumption would also increase 2-1/2 fold. By equipping the engine with a spark ignition system, it was possible to operate successfully on ammonia at normal compression ratios and retain the case fuel injection system. Fuel injection and spark timing were found to be critical. Indicated power output was reduced by about 10%, which differed from prediction. The discrepancy was due to the poor combustion characteristics of ammonia. Predicted increase in fuel consumption were experienced. Because ammonia is not 'smoke limited' as is diesel fuel, it was possible to increase the smoke free output from the engine by going to richer mixtures with ammonia. (Authors' abstract)

10075

Williams, A. F.

OIL FIRING AND ODOUR PROBLEMS. (Duo Olfeuerung in Hinblick auf Emissionsprobleme.) Text in German. Schweiz. Arch. Angew. Wiss. Tech. 31(5):105-112, April 1965. (presented at the S.V.W.G. Meeting Zurich, Switzerland, Sept. 11, 1964, Preprint in English.)

Smoke and soots are indicative of incomplete combustion. We propose to deal with underlying causes and curative measures which concern mainly the design and operation of the combustion appliance. We shall discuss the various types of burners which are being used, particularly those which are prevalent in Switzerland for room and whole house heating. These are mainly pressure jet burners with sea pot burners rated 15000 k cal/h and above and operated on distillated use oil. We shall comment on the relative merits of ON-OFF and HIGH/LOW fire operation and quote test results for smoke and unburnt hydrocarbons produced by various burners during continuous firing or intermittent operation. Such unburnt hydrocarbons can give rise to unpleasant odours. We shall show that a low smoke condition is related primarily to good draught and an optimum excess air value inside the fire box. Various new attempts to procude small, highly efficient atomising burners will be mentioned. These include ultrasonic atomisation and the Ventrex blue flame, atomising with vaporising burner. Lastly, in reference to typical Swiss oil quality and the standards set by SVV Institute, we shall give some results showing the influence of aromatic content of the oil on its smoking propensity. Some mention will also be made about sulphur in the fue and SO2 emission from the chimney. (Author's summary, modified)

10139

Brubacher, Miles L. and Donal B. Gibson

SMOG TUNE-UP FOR OLDER CARS. In: Vehicle Emissions, Part II SAE Progress in Technology Series, Vol. 12, New York Society of Automotive Engineers, Inc., 1969, p. 268-290. 20 refs. (Presented at the SAE Southern California Section, April 1969.)

Surveys of smog forming pollutants from the exhaust of the California car population have shown a tremendous range of emissions between the worst and the best cars. A study was conducted to determine the effectiveness and cost of various tune-up approaches to the auto exhaust emission problem. Four phases of tune-up were explored and pertinent facts and data are included in this paper. Three major engine systems affecting emissions of older cars are ignition, carburetion, and exhaust valve leaks. Exhaust control is predicted to be a $150,000,000 annual business and the incentive exists to develop more effective and cheaper control systems. The average annual tune-up cost was about $30. (Authors' abstract, modified)

10292

W. J. Mullin, S. Berkowitz

MECHANISMS OF COAL PYROLYSIS VIII--THE ISOTHERMAL DISENGAGEMENT OF CO AND CH4 IN THE RANGE 570-670C. Fuel, 47(1):61-77, Jan. 1968. 11 refs.

Isothermal rates of disengagement of CO and CH4 from anthracite, bituminous and sub-bituminous coal chars at temperatures between 570 and 670 C follow pseudo-first order kinetics, but indicate that the initial gas discharge is governed by two concurrent control-mechanisms. Of these, the more sustained can be identified with a diffusion process for which D is less than 5 kcal/mole and D is about 1 times 10 the minus 8th power cc/sec. The other, which superimposes itself on diffusion, appears to be the actual rate of formation of CO (or CH4) within the decomposing coal mass. The relative importance of these two controls changes with rising reaction temperature, diffusion governing virtually all gas discharge below about 600 C but controlling only about 30-40 per cent of the total CO and CH4 flow at 670 C. It is suggested that these findings, and, in particular, the dual rate control, are the inevitable consequences of the existence of two partially interconnected but strongly size-differentiated and effectively 'independent' pore systems in coal and coal chars. (Authors' abstract, modified) ##

10428

Jenkins, G. I. and R. P. Walsh

QUICK MEASURE OF JET FUEL PROPERTIES. Hydrocarbon Process. Petrol Refiner, 47(5):161-164, May 1968. 2 refs.

luminometer number, smoke point, aromatics content, and hydrogen content of kerosene type aviation fuels can be calculated directly from the aniline point and gravity by using tables and graphs compiled in this report. Calculated values for these properties hav proven to be generally more precise than single experimental determinations.

10429

Juntgen, H. and K. H. Van Heek

GAS RELEASE FROM COAL AS A FUNCTION OF THE RATE OF HEATING. Fuel 47(2):103-117, March 1968. 10 refs.

Fundamental work on the kinetics of coal pyrolysis at continuously rising temperatures is described. The theory of non-isothermal reaction kinetics is used to calculate the dependence of gas releasing reactions on temperature, taking as parameters the reactio order, the activation energy, the frequency factor and the rate of heating. Furthermore, it is possible to calculate the reaction parameters from curves established by measurements under non isothermal conditions. This theory was checked against the thermal decomposition of simple organic molecules and has been found to be i good agreement with experiment. The simplest curves of gas emission rate from coal as a function of temperature are obtained for higher gaseous hydrocarbons. This type of curve is interpreted in terms of a single reaction, whereas the release of methane and hydrogen is more complicated. To show the influence of heating rate, the release of ethane from a finely-ground coal (19.15 VM) was measured at different values between 0.01 and 100,000 deg. C/min. These experiments agreed well with the theory, assuming a first order law with a mean activation energy of 62.1 kcal/mol and a mean frequency factor of 10 to the 11th power per min. Also, the theoretically calculated shift of the reaction to higher temperatures with increasing rates of heating was exactly confirmed by experiment. (Authors' abstract)

10475

Gage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. (SUMMARY REPORT.) California Inst. of Tech., Pasadena, Chemical Engineering Lab., 26 p., 1968. 1 refs.

A research program dealing with the influence of oscillatory combustion of various fuels on the residual quantities of nitrogen oxides and other partial oxidation products is summarized. Experiments were conducted at a pressure of 50 lb./sq. in. employing air and a range of fuels including natural gas, ethane, propane, and butane. The highest NOx levels occurred at near stoichiometric mixture levels, with a sharp decrease at richer mixtures, and a more gradual decrease at leaner mixtures. The budget of the program, along with a list of publications and reports and personnel requirements, is presented.

10611

Shvortsova, N. N. and S. N. Rimina

ATMOSPHERIC POLLUTION BY 3,4-BENZPYRENE IN THE VICINITY OF A TIMBER-CHEMICAL PLANT. ((O zagryaznenii vozdushnoi sredy 3,4-benzpirenom v rayone zagotovitelnya -mokhimicheskogo proizvodstva.)) Hyg. & Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):159-161, Jan.-March 1968. 6 refs.
CFSTI: TT 68-50449/1

A timber-chemical plant with retort, tar-distilling, chemical carburation, drying and other shops, was investigated. Atmospheric pollution by 3,4-benzpyrene, tarry substances, free silicon dioxide, xylvan, phenol, a acetic acid and methanol was measured around the plant. Aspiration samples were taken in summer and snow samples in winter. Samples from wood pyrolysis were investigated to give information concerning accidental discharge of 3,4-benzpyrene. Environmental studies were accompanied by statistical studies of morbidity and mortality among population residing around the plant and in a control area.##

10660

Laffey, William F. and Robert H. Manning

SOLVENT SELECTION FOR THE REDUCTION OF AIR POLLUTION. Hercules Chem., No. 5611-6, March 1968. 5 refs.

Regulations restricting the use of solvents which partake in photochemical smog reactions have caused the solvent and surface coating industries to develop alternate solvent formulations. A system is presented whereby a restricted solvent can be simulated using combinations of allowable materials. The procedure is graphical and depends on the solvent parameters and solubility characteristics of the materials. When several formulations are found which possess the required solvent properties, the choice of the best one then depends on economic or other factors.##

10662

Cline, E. L. and Lee Tinkham

A REALISTIC VEHICLE EMISSION INSPECTION SYSTEM. Preprint, Clayton Manufacturing Co., El Monte, Calif., Dynamometer Div., [12]p., 1968. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-152.)

A one minute mass vehicle exhaust emission inspection system is described to aid those seeking to establish an appropriate effort in compliance with the Air Quality Act of 1967. This proposed inspection is suitable for both emission controlled and pre-emission controlled automobiles. It is oriented to appropriate Auto Service Industry corrective measures since it provides guidelines as to probable cause of unnecessarily high emissions for each selected vehicle. This capability is essential to avoid abnormal corrective expense due to excessive repairs or continued high

emissions due to inadequate repairs. Low skill levels may be used during the inspection process, yet results are repeatable and consistent in a plurality of inspection stations. The net gain in lower emissions through inspection of in-use vehicles is large because the point of rejection is no longer dictated by the inherently high emission vehicles. Not more than two rejection standards are required for emission controlled vehicles, and only one for pre-emission controlled vehicles. This includes all domestic and foreign makes. These standards are flexible in that they may be initially liberal and gradually tightened as circumstances warrant. Such policy changes or future spark ignition engine designs will not significantly obsolete the hardware required to perform this inspection. The fundamental techniques employed permit the use of greatly simplified equipment and instrumentation with resultant lower initial cost and increased reliability than previously envisioned meaningful inspection methods. A study of nearly 1000 automobiles over a one year period evolved and documented this proposed inspection system. Qualified persons may study this work to any depth desired by contacting the authors. (Authors' abstract, modified)

10736

Charles R. Begeman, and Joseph R. Colucci

BENZO(A)PYRENE IN GASOLINE PARTIALLY PERSISTS IN AUTOMOBILE EXHAUST. Science, 161(3838):371, July 19, 1968.

On average 36 percent of the benzo(a)pyrene in an automobile's exhaust gas comes from the benzo(a)pyrene originally in the gasoline. Between 0.1 and 0.2 percent of the benzo(a)pyrene in the gasoline survives the combustion process and is recovered from the exhaust; 5 percent accumulates in the crankcase oil. Some of the benzo(a)pyrene in the gasoline is converted into other polynuclear aromatic hydrocarbons and other more polar compounds. For our experiments we used commercial gasoline containing benzo(a)pyrene at 1.0 part per million to which was added benzo(a)pyrene-B,9 to the minus 11th power C at 1.1 parts per million as a radioactive tracer. (Authors' abstract)##

10741

Chakraborty, B. B.; and R. Long

THE FORMATION OF SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS IN DIFFUSION FLAMES--PART ONE. Combust. and Flame, 12(3):226-236, June 1968.

The amount of chloroform soluble material, polycyclic aromatic hydrocarbons (PCAH) and carbonaceous residue (CR), in the dry soot recovered from an ethylene diffusion flame have been determined and the effects on these of changes in the oxygen index (i.e. the mole fraction of oxygen in the mixture) of oxygen-nitrogen and oxygen-argon mixtures supplied to the flame have been investigated. In the oxygen-nitrogen mixtures, there is a rapid decline in the amount of PCAH in the soot as the oxygen index increases from 0.18 to 0.26. The amount of soot reaches a maximum at an oxygen index of about 0.26 and above this value it declines rapidly being then composed almost entirely of

carbonaceous material. The decline in the amounts of individual PCAH in the soot with increase in oxygen index has been investigated. Substitution of nitrogen by argon leads to higher temperatures in the reaction and pyrolysis zones and at lower oxygen indices the effect is to favour the formation of CB and to lead to a reduction in the amount of PCAH in the soot. At higher oxygen indices, the amounts of soot (actually CB) are less. From the point of view of air pollution, the results emphasize the undesirability of either a general, or local, depletion of oxygen. (Author's abstract)##

10768

Fenimore, C. P., and G. W. Jones

COMPARATIVE YIELDS OF SOOT FROM PREMIXED HYDROCARBON FLAMES. Combust. and Flame, 12(3):196-200, June 1968.

Ethylene and acetylene gave eight times more soot when burnt with oxygen. The comparison was made in flames having the same temperature, and about the same peak concentrations of species from which the soot is supposed to grow (hydrocarbon radicals, acetylene and polyacetylene). We suggest that more effective oxidation of the soot aggregates, particularly during their early stages of growth occurred in oxygen flames, and this decreased the yield. Hydrogen chloride added to acetylene-oxygen flames increased the yield of soot without increasing the concentrations of polyacetylenes. Here too, the yield may have been altered mainly by changes in the oxidation of the early soot aggregates. (Authors' abstract)##

10775

Yader, S. A., W. H. Wiser, and G. R. Hill

KINETICS OF THE HYDROREMOVAL OF SULFUR, OXYGEN, AND NITROGEN FROM A LOW TEMPERATURE COAL TAR. Ind. Eng. Chem. Process Design Develop., 7(3):390-397, July 1968. ((11)) refs.

The result of the batch hydrogenolysis of S, O, and N compounds of a low temperature tar in the presence of a MoS2 catalyst indicated that all the hetero atoms can be completely removed at 500 degrees C. and a pressure of 1500 p.s.i. Cracking, aromatization, and possibly dehydrogenation reactions start at temperatures above 375 degrees C. The hydrogenation of aromatic hydrocarbons starts at a pressure of 1250 p.s.i. The hydroremoval reactions of S, O, and N are all first order with respect to the heterocyclic molecules. Sulfur removal follows a true Arrhenius Temperature dependence, but the removal of O and N shows slight curvatures in the Arrhenius plot which can be resolved into two parts, each approaching linearity with a break at 400 degrees C. and having different activation energies. The magnitude of energies of activation and enthalpies of activation obtained suggests that chemical reactions but not physical processes are rate controlling. The surface reaction involving the rupture of the C- S, C- O, and C- N bonds of the heterocyclic molecules appears to be the rate-determining step. (Authors' abstract)##

11087

Rispoli, Jose A.

FIGHT AGAINST AIR POLLUTION IN ARGENTINA EDUCATIONAL, LEGAL AND TECHNOLOGICAL ASPECTS. Preprint, Tecnica de Higiene (Argentina), 20p., June 1968. 31 refs.

Air pollution is an increasing problem in the Argentina cities of Buenos Aires, Rosario, La Plata and Mar del Plata. Air pollution control measures are not keeping pace with the growth of industries, which are often located in neighborhoods of populated areas. The Municipio Director of Hygiene supervises the problems of automotive emissions and industrial and domestic emissions. About one million vehicles travel daily in Buenos Aires. Traffic throughfares are being modified in order to eliminate congested traffic areas. The Director of Hygiene studies daily the chemical control of the pollutants of hydrocarbons, carbon monoxide and sedimented particles. The "Argentina Association for Air Contamination of sanitary education on all levels for the population.##

11141

Dearden, P. and R. Long

SOOT FORMATION IN ETHYLENE AND PROPANE DIFFUSION FLAMES. J. Appl. Chem., (London) 18(8):243-251, Aug. 1968.

Small samples of gas have been withdrawn from the luminous regions of the diffusion flames of ethylene and propane burning on a Wolfhard-Parker burner and these have been analysed by gas chromatography. In general, the parent hydrocarbon is rapidly decomposed on approaching and within the luminous region, acetylene being the major hydrocarbon product found. The concentration of acetylene falls rapidly near the interface with the oxidation zone suggesting that the main hydrocarbon oxidised in the latter is acetylene. The rates of soot collection, the uncorrected temperatures in the flames and the concentration of stable hydrocarbon species have also been measured when oxygen, hydrogen and acetylene respectively were added to the fuel stream. Oxygen, when introduced into the fuel, leads to increased temperatures and sooting rates in the case of ethylene and to increased temperatures but decreased sooting rates in the case of propane. The sooting rates of flames of ethylene with acetylene or oxygen as additives increased linearly with the area under the acetylene concentration profile in the luminous zone (measured at a height of approximately 5 mm above the burner). This area is proportional to the amount of acetylene present in the luminous zone at this height, which corresponds roughly with the onset of luminosity. Acetylene thus appears to be the major stable species via which soot is formed in such flames. Propane flames with oxygen as additive to the fuel, however, behave differently in that although there is an increase in temperature and in the amount of acetylene in the luminous zone the sooting rate decreases. This discrepancy remains unexplained and requires further investigation. (Authors' abstract, modified)

11152

Heiler, Austin M.

THE ROLE OF THE SCIENTIST IN URBAN ECOLOGY. Trans. N. Y. Acad. Sci., 30(8):1027-1044, June 1968.

Scientists play a central role in the management of air problems in New York City. An emission inventory procedure has been established for evaluation of the emissions into New York City's air from hundreds of thousands of sources. The principal objective of this inventory is to give an estimate of the spatial and temporal distribution of emissions. The monitoring network is based on a technical evaluation of the complex meteorological problems. Pollutant systems must be viewed from the point of view of multi-components, since the synergistic interaction of pollutants has a profound effect on the problem. The air resource management encompasses economic, sociological, technological, and physiological factors. Only through effective use of computer techniques can the interplay of these diverse problems be handled in a reasonable time.##

11171

Wheatley, R.M and R. J. Harper

WAY TO DETERMINE SULFUR IN PETROLEUM. Hydrocarbon Process. Petrol. Refiner 47(10):133-137, Oct. 1968.

Emphasis upon sulfur-free products for the benefit of man and machine as well as low sulfur refinery feed stocks that permit prolonged life of process catalysts has resulted in a concentrated effort toward sulfur reduction. Because critical areas of analysis are often in the range of 0 to 50 parts per million, a rapid and accurate sulfur method in this range was sought. Such a method was found in the application of the oxy-hydrogen Wickbold burner in which the material is combusted and the reaction products absorbed in water containing a small amount of hydrogen peroxide. The sulfate formed in the combustion oxidation process is titrated with standard barium perchlorate using thorinmethylene blue indicator.

11231

J. H. Hasser, G. B. Martin, and R. F. Hangebrauck

EFFECTS OF COMBUSTION GAS RESIDENCE TIME ON AIR POLLUTANT EMISSIONS FROM AN OIL-FIRED TEST FURNACE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ([20])p., 1968. 5 refs. (Presented at the National Oil Fuel Institute Workshop, Linden, N. J., Sept. 17-18, 1968.)

The effects of increased combustion gas residence time on air pollution emissions from an experimental oil furnace are described and compared with earlier data to illustrate the resultant reduction of carbonaceous emissions. Particulate matter, smoke, carbon monoxide, and gaseous hydrocarbon emissions were reduced, and satisfactory operation obtained at lower excess

air levels. Sulfur oxides emissions were essentially unchanged. Nitrogen oxides emissions increased by a small amount. Oxygen and carbon dioxide concentrations in the flue gas were closer to theoretical values, indicating a significant improvement in combustion efficiency. Revised combustion chamber design criteria balanced with improved burner design should provide low air pollutant emissions and optimum operating efficiency for fuel-oil-fired domestic furnaces. (Authors' abstract, modified)##

11258

Springer, K. J.; G. L. Williams, R. W. Olsen, and Kenneth D. Mills

EMISSIONS FROM GASOLINE-POWERED TRUCKS ABOVE 10,000-LB GVW USING PDS PROPORTIONAL SAMPLING TECHNIQUES. Preprint, American Institute of Chemical Engineers, New York, N. Y., 11p., 1968. 8 refs. (Presented at the 61st Annual Meeting, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 53C.)

Exhaust emissions, including hydrocarbons, CO, CO2, and NOx, from three gasoline-powered trucks above 10,000-lb gross vehicle weight are presented. Proportional techniques were used to obtain exhaust samples, permitting emissions to be analyzed and reported on a mass basis. A discussion of the preparations and dynamometer test procedures is included. (Authors' abstract)##

11261

Reamer, H. H.; Joan Jacobs, and B. H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. EFFECT OF FUEL. Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((29))p., ((1968)) 10 refs.

The effect of varying the fuel from natural gas to ethane, propane and n-butane upon oscillatory combustion in a cylindrical chamber 1 in. i.d. and approximately 24 in. in length was investigated experimentally. A significant effect upon the residual quantities of nitrogen and upon the double amplitude of the perturbation in normal stress was noted. Little, if any, effect upon the frequency of the longitudinal perturbations was experienced. The results are presented in tabular and graphical form. (Authors' abstract)##

11269

Reid, William T.

KILOWATTS FOR CARS - A COMPARISON OF ENERGY COSTS FOR ELECTRIC AUTOMOBILES. Boston, Mass., Battelle Memorial Inst., Columbus, Ohio, 7p., 1968. (Presented at the 3rd Annual Meeting, American Institute of Aeronautics and Astronautics, Nov. 29-Dec. 3, 1968, Paper 68-978.)

Success of electric vehicles for passenger service will hinge around costs as well as reliability, size, styling, and such indirect advantages as the elimination of air pollution. Costs, in turn, will depend mostly on the energy package, whatever it may be eventually. Primary and secondary batteries, fuel cells, combined cycles, and linear induction systems all have some place in powering an electric automobile, but their price to the eventual consumer is still uncertain. This paper outlines briefly some of the basic cost factors underlying selection of the optimum energy package. It points out where further scientific and engineering development will be necessary to arrive at a suitable compromise between what the average motorist will want and what he can afford to pay. Many of these costs must be based on engineering assumptions, but reasonable estimates are furnished based on the present state of the art and on expected advances in the foreseeable future. (Author's abstract)##

116577

Brunner, W.; H. Hoffmann; O. Nottche, L. Trueffert, W. Renn, T. Muller, D. Hogger, H. Brunner, J. Richter, and H. Frick

AIR POLLUTION BY MOTOR VEHICLE EXHAUST GASES. ((Die Verunreinigung der Atmosphare durch die Abgase der Motorfahrzeuge.)) Translated from German. Alimenta (Nichberg), 4(8):211-220, 1965. (Summaries of papers presented at a symposium held by the Swiss Commission for Air Sanitation, Zurich, Sept. 22-23, 1965).

A review of several lectures presented at the Federal Commission for Air Hygiene in Zurich, Switzerland on pollution of the atmosphere by motor vehicle exhaust gases is presented. The following lectures are included in the form of brief communications: 1. The composition of exhaust gases produced by gasoline-burning engines; 2. The composition of exhaust gases of diesel engines; 3. The pollution of the atmosphere in traffic centers of large cities Abroad; 4. Air pollution caused by the exhaust gases from the automobile in Paris and its environs; 5. Survey of investigations of the air conducted in Zurich from 1961 to 1965; 6. The pollution of the atmosphere-observations in Switzerland; 7. Effects of exhaust gases on humans, animals, and plants; 8. The influence of the fuel composition; 9. Traffic sanitation and hygiene of the air; and 10. Police regulations and their enforcement. Pollution of the atmosphere by motor vehicle exhaust gases in Switzerland is emphasized.##

11491

Rasnina, N. I.

AIR POLLUTION BY VOLATILES LIBERATED BY SOME PLASTICS. ((O zagryaznenii vozdukha letuchimi veshchestvami, vydelyayemymi plastikami.)) Gig. i San. (English translation of: Gigiena i Sanit.), 33(4-6):267-269, April-June 1968.
(PB181; PT 68-50409/2

The liberation of volatiles from plastics based on polyester resins PN-1 and PN-69 was investigated. Plastic samples

Nos. 1 and 2 contained polyester resin PR-1, isopropylbenzene hydroperoxide, cobalt naphthenate and cement, while sample No. 3 contained resin PR-1 and PR-69, isopropylbenzene hydroperoxide and cobalt naphthenate. Styrene was used as the solvent for the resins. The dynamics of the liberation of volatiles by these plastics as a function of temperature were investigated spectrophotometrically and chemically. The spectral characteristics of samples suggested the liberation of organic substances with an optical density of wavelength range 215-300 m. The concentration of liberated substances was found to be directly related to the temperature. The air of premises in which polymer materials are used is liable to be polluted by a complex mixture of volatiles which are extremely difficult to identify by the available techniques. The chemical and spectrophotometric data suggest that plastics based on polyester resins and manufactured by cold cure liberate appreciable amounts of volatiles, the concentrations of which are a function of temperature.##

11562

Ewald, Herbert and Gustav Ewrich

ANALYSIS OF THE INTERESTING COMPONENTS OF EXHAUST GASES. ((Die Analytik interessierender Abgasbestandteile von Auspuffgasen.)) Text in German. Freiberger Forschungsh., (A187):131-161, 1960. 140 refs.

Recent methods for the determination of CO, CO_2, NO, NO_2, hydrocarbons, and hydrocarbon combustion products in air and exhaust gases are reviewed in detail, with a discussion of their relative sensitivity, accuracy, and convenience. Data are also presented on the concentrations of some of these components during the operation of gasoline and diesel engines under various conditions. The sensitivity of various methods for the determination of some of these components and the prices of some of the analytical equipment (gas chromatographs, mass spectrometers, photometers, other spectrometers, and gas analysers) required are given in tabular form. It is concluded that rapid testing or testing performed in mobile laboratories usually must be made by Orsat analysis or test capsules, while continuous measurements of exhaust gas components for control purposes can be done photometrically. For most purposes, ultraviolet and mass spectrometery have been replaced by gas chromatography, which is cheaper and more informative; however, spectrometric techniques are useful for identifying component detected by gas-chromatograph. Although basically a discontinuous process, gas chromatography can be automated.##

11615

Nowakowski, Paul

LUMINESCENT SMOKE GENERATION FEASIBILITY STUDY (FINAL REPORT). Missouri Research Labs., Inc., St. Louis, Mo., Contract N61339-67-C-0095, Task 5709, NAVTRADEVCEN 67-C-0095-1, 25p., May 1968.
CFSTI: DDC AD 675503

The methods, test results and conclusions that comprise the effort of expanding the potential of a smoke generating device into the

reals of fluorescent response are described. In order to satisfy the requirements generated in this task, several areas of investigation were included in this program. To determine sources of fluorescent response and to ascertain the state of the art, literature was surveyed. The next step involved a study of the smoke generating device to determine the potential and the limitations of the smoke generating mechanism. When the most promising candidates for fluorescence had been procured, they were tested in the apparatus varying the solvent and the concentration. This physical testing prompted further work, using procured and tested and when the most promising formulations were ascertained, the stability of the fuel and the characteristics of the smoke cloud were determined. The forecasts. (Author's summary, modified)##

12088

Fink, C. K. and J. E. Weigel

OXYGENATED SOLVENTS, REFORMULATING NITROCELLULOSE LACQUERS. Paint, Varnish, Prod., 58(12):38-41, Dec. 1968.

Oxygenated solvents in combination with allowable aromatic and exempt hydrocarbon diluents have been accepted as an approach to compliance with air pollution controls. A guide to reformulation based on recent research into solvent composition-solution viscosity relationships is presented. Data are presented relating the composition of complying solvent systems to viscosity of nitrocellulose solutions prepared with these solvents. In addition to viscosity, a solvent mixture must have a balanced evaporation rate. A listing of acceptable solvents by relative evaporation rate is also presented.##

12089

Greaves, D. A. and I. G. Smith

NATURAL GAS CHALLENGES THE GAS INDUSTRY. PART TWO. Gas World, 168(4394):422-426, Nov. 2, 1968.

Natural gas at present supplies 16 to 17% of total world energy needs on a heat content basis and this may rise to about 25% by 1985 with the proportion varying widely from country to country. Some of the problems encountered in burner design are discussed. The need for ways of meeting peak loads cheaply is of importance. Liquefied natural gas is more easily stored and transported. Purification by removal of the acid gases is an important step in liquefaction of natural gas. Some of the methods used are discussed.##

12159

Friscelli, J. W.

BURNING DEVICE ELIMINATES AIR POLLUTION IN THE DISPOSAL OF WASTE ALUMINUM ALKYLS. Preprint, Texas Alkyls, Inc., Houston, Texas, 9p., 1964. (Presented at a meeting of the Air Pollution Control Assoc., Houston, Texas, June 1964.)

Disposal of industrial wastes containing aluminum alkyls presents a difficult problem in the control of air pollution. Aluminum alkyls are not toxic or explosive, but they are so active chemically that they ignite and burn spontaneously on contact with air, releasing dense smoke. Their reaction with water is violent and liberates hydrocarbon vapors. The design, construction and performance of a unique smokeless burning device that has provided a safe, efficient and economical method for eliminating air pollution associated with disposal of waste aluminum alkyls is described. The use of this device has been extended to disposal of other materials such as kerosene, benzene and toluene. However, its full potential as a tool for air pollution control remains to be developed. (Author's abstract)

12161

Hefner, Herbert C. and George C. Lawrason

A STUDY OF ETHANOL-GASOLINE BLENDS AS AUTOMOTIVE FUEL. Preprint, Southwest Research Inst., San Antonio and Houston, Texas, 11p., 1966. (Presented at the 59th Annual Meeting of the Air Pollution Control Association, Houston, Texas, June 21-25, 1966.) paper 66-76.

An investigation of ethanol-gasoline blends as a fuel for modern automotive engines was undertaken. Primary emphasis in the early phases of the program was devoted to determining the operating characteristics of typical automobile engines with various amounts of ethanol added to conventional gasoline. Along with this investigation, a few preliminary tests were made to determine the amount of unburned organic vapor emitted in the exhaust, comparing the emission of an ethanol-gasoline blend with the emission of a leaded gasoline of the same octane number. It was immediately evident that a significant reduction in hydrocarbon concentration occurred with the ethanol-gasoline blends, and additional work was performed to investigate this particular factor in more detail. It is concluded, however, that before a large scale change in fuel composition are undertaken, several factors needed extensive investigation.

12521

R. D. Ayers

ALTERNATIVE NONPOLLUTING POWER SOURCES. S.A.E. (Soc. Automot. Engrs.) J., 76(12):40-60, Dec. 1968.

An urban transportation crisis grips the nation--its symptoms: thickening pollution, rising accidents, and ever increasing congestion. Currently, emissions appear to be the most pressing problem, therefore, responsible engineers must now consider alternative nonpolluting power sources. External combustion engines with steam or another fluid as the working medium are available now as an economic alternative to the internal combustion engine. The major virtue of the external combustion engine is an almost complete lack of emissions without compromise of engine performance. Steam eng/nes offer simplifications in power train design as they possess high torque at zero speed eliminating the need for a

transmission. In hybrid systems, a small, constant speed internal combustion or external combustion engine drives a high-speed alternator-inverter which both powers electric motors at the wheels and charges a battery. While overall efficiency would equal that of present engines and emissions would be drastically reduced, the cost penalties for private automobiles would be substantial. Therefore, the use of hybrid systems appears likely only for specialized situations which might include trucks and buses. Electric propulsion systems based on lead-acid batteries are possible now for small, limited performance vehicles. If high energy batteries become an economic reality, small cars comparable to the Volkswagen and Renault will become possible. With the development of low cost fuel cells, fuel cell-battery hybrids will present an attractive alternative since the introduction of the fuel cell into the system would give these vehicles a much needed increase in range. The present state of development and a careful overview of the potential of these alternative energy systems is presented in detail.##

1967

Saito, Takeshi

INFLUENCE OF FUEL TYPES OF COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. (Jidosha haiki gasu ni oyoboasu nenryo somai no eikyo). Text in Japanese. Nenryo Kyokai Shi (J. Fuel Soc. Japan), 46(3): 148-159, 1967. 8 refs.

A continuation of the investigation of the influence of different fuels on the composition of automotive engine exhaust constituents is reported. The relations between the olefin content of fuel and exhaust constituents are experimentally shown using an internal combustion engine on a dynamometer block. Test fuels included two gasolines of different olefin content, commercial LPG, and pure propane. Carbon monoxide, hydrocarbons, H_2, O_2, CO_2, N_2, and nitrogen oxides were analyzed by gas chromatography. Unsaturated olefins were detected with an absorber reported by W. B. Innes. A special sampling apparatus using a magnetic bulb was constructed for analysis under acceleration. A hydrogen flame ionization detector was used for hydrocarbon analysis; molecular sieve and active charcoal were used for inorganic analyses; phenol disulfonic acid was used for nitrogen oxide determinations. Analytical data are shown for various engine loads and speeds. It is concluded that CO concentration depends on air-fuel ratio only and is not influenced by fuel composition. Differences in total hydrocarbon content of exhausts from different fuels are quantitatively small, but unsaturated hydrocarbons, which contribute to air pollution reactions, increase slightly with the fuel olefins.

1956?

Chandler, J. H.

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES. Proc. Am. Petrol. Inst., Sect. III, 36:324-335, 1956. (Based on a report of the Variables Panel of the Coordinating Research Council Group on composition of exhaust gases, Aug. 1957.)

The effects of engine variables on the concentrations of hydrocarbons and nitrogen oxides in automotive exhausts are discussed. The factors affecting hydrocarbon concentration in exhaust gas are manifold vacuum, engine detuning, and cold as compared to hot engine starting. Manifold vacuum of more than 21.5 in. of mercury accounts for high hydrocarbon concentrations during deceleration. This effect is accentuated by manual transmissions as compared to automatic. Enriched carburetor idle setting increases hydrocarbon emission at cruising speeds up to 30 mph. Spark-plug condition is important because one misfiring plug may more than double the average hydrocarbon concentration. Among the variables affecting nitrogen oxides, air-fuel ratio is of primary importance. Lean mixtures promote the formation of nitrogen oxides and increase the effects of other engine variables. Under full throttle, rich mixture conditions, the concentrations are relatively low. Under road-load cruise conditions and during fast throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations, speed has no effect, and high concentrations may be exhausted even at low speeds. During idling and deceleration, nitrogen oxides concentrations are so low as to be considered insignificant.

13660

Robb, R. W.; W. R. Johnson, J. J. Westbrook, and R. R. Seligman

MODEL PYROLYSIS - THE STUDY OF CELLULOSE. Beitr. Tabakforsch., 3(9):597-604, Dec. 1966. 4 refs.

Relating smoke products to smoke precursors is an ambiguous task when burning any naturally occurring plant. To facilitate interpretation, a simple model pyrolysis system was studied using cellulose as the smoke precursor and monitoring benzo(a)pyrene as the smoke product. Data obtained show how pyrolysis was affected by changes in atmospheres, varied pyrolysis temperatures, the addition of inorganic materials, and chemical modifications of the cellulose molecule. It is hypothesized that cellulose can undergo pyrolysis by two different modes to form benzo(a)pyrene. Large quantities of the hydrocarbon can be formed by high-temperature (850 C) isothermal pyrolysis of cellulose via an efficient gaseous reaction route. In this reaction, the benzo(a)pyrene yield decreased in the presence of iron, cobalt, and nickel, while the yield increased with increasing temperatures and with the introduction of oxygen into the system. In contrast, graduated heating experiments demonstrated that benzo(a)pyrene began to form at 450 C. This reaction was inefficient with respect to benzo(a)pyrene yield and was unaffected by the presence of metals. The benzo(a)pyrene precursors appeared to be nonvolatile, being formed from the solid decomposition of cellulose. This reaction was inhibited by nitric oxide or salts generating nitric oxide. Additionally, oxidation of the cellulose molecule at the C6 position produced a decreased benzo(a)pyrene yield. (Author summary modified)

11795

Lawson, D. R., Sr.; J. Byrne, A. R. Cunningham, D. L. Hendrickson, and R. L. Winkler

ECONOMICS OF CHANGING VOLATILITY AND REDUCING LIGHT OLEFINS--U. S. MOTOR GASOLINE. Proc. Am. Petrol. Inst., Div. Refining, vol. 48:693-704, 1968. 28 refs.

Three simulated refineries were used to evaluate five changes in gasoline specification. These included one higher and two lower levels of motor gasoline volatility and two levels of reduced light olefin content at constant volatility. The results were then extrapolated to obtain information applicable to the entire U. S. Summaries of added costs and investments for the various cases studied are tabulated. The costs are presented relative to two reference points, the base case and the modified case. The base cases resulted from a rigorous simulation of the actual refining operations conducted in the year 1965, including the proportion of zeolite cracking catalyst which was actually being used during that year. The modified base cases were obtained by allowing for the increased use of zeolite catalyst from 30 to 100% and the addition of capital investment. It is concluded that it is technically possible with present refining technology to manufacture motor gasoline of substantially lower volatility or reduced light olefin content.

13951

Sorenson, S. C. and H. K. Newhall

KINETICS OF HYDROCARBONS IN ENGINE EXHAUST SYSTEMS. Preprint, Combustion Inst., Central States Section 9p., 1968. (Presented at the Meeting of the Central States Section of the Combustion Inst., Columbus, Ohio, March 1968.)

Chemical reactions possibly occurring in engine exhaust systems are oxidation of hydrocarbons with an attendant reduction in emissions and modification of hydrocarbon structure giving rise to a change in photochemical reactivity or smog-forming potential of the exhaust products. This work consists of a theoretical estimation of the various hydrocarbon reactions which might be of importance. A mathematical model of an isothermal, well-mixed steady-flow system was used. Theoretical results indicate that pyrolysis and oxidation mechanisms may both be of importance in exhaust gas reactions, and that the hydrocarbons ultimately found in the exhaust gas may be significantly different from the parent hydrocarbons. The results also indicate that the time required for complete oxidation is approximately 0 millisec at the high temperatures and free radical concentrations employed. These are extreme values and representative of only a completely insulated exhaust system. The oxidation process is accompanied by a large increase in the rate of energy release due to chemical reaction. Preceding oxidation, a large increase in the concentrations of free radicals and non-fuel hydrocarbons occurs. Significant pyrolysis products building up prior to oxidation include ethylene, acetylene, and methane. All of these are ultimately destroyed in the oxidation process, given sufficient time. (Author abstract modified)

13952

Lindberg, Walter

AIR POLLUTION IN NORWAY. I. THE GENERAL AIR POLLUTION IN NORWEGIAN CITIES AND INDUSTRIAL TOWNS. (Den almindelige luftforurensning i Norge. I. Generelt om luftforurensning i byer og tettbygde strok.) Translated from Norwegian. Oslo Univ. (Norway), p. 1-65, 1968. 12 refs

General information is presented on air pollution in Norway with attention focused on (1) the sources and types of pollutants: motor vehicles, heating plants, incinerators, (2) air pollution levels in the cities, including dustfall, SO2, and smoke measurements in Oslo, Sweden, (3) special investigations (sulfuric acid fog), the chemical composition of solid particulates in smoke and suspended dust, polynuclear hydrocarbons and particulates, trace elements, (4) pollutants in Norwegian cities other than Oslo, (5) directions for medicohygienic evaluation of pollution levels in cities and other densely populated districts and industrial regions, and (6) an evaluation of the economic consequences of air pollution.

14033

Pahnke, Alden J. and Jesse F. Conte

EFFECT OF COMBUSTION CHAMBER DEPOSITS AND DRIVING CONDITIONS ON VEHICLE EXHAUST EMISSIONS. Preprint, Society of Automotive Engineers, Inc., New York, N. Y., 29p., 1969. 15 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690017.)

Hydrocarbon exhaust emission levels of new cars driven under consumer-type conditions increase during the initial 5000 to 10,000 miles of operation; the magnitude of the increase is less with vehicles equipped with exhaust control systems. The role of combustion chamber deposits in increasing hydrocarbon exhaust emission levels during the initial period of vehicle operation was considered. Analyses have shown these deposits to contain high concentrations of lead salts originating from the combustion of lead alkyls present in gasoline. Two consumer-type vehicle tests to determine the effect of leaded and unleaded gasoline on exhaust emissions were completed. One test involved 122 cars without exhaust control systems and the other, 36 cars with exhaust control systems. In both tests, hydrocarbon exhaust emissions of the leaded and unleaded cars increased during the initial period of mileage accumulation and then leveled out as equilibrium was reached. Average hydrocarbon emission levels of the leaded cars were higher than those of the unleaded cars with the difference or net lead effect amounting to 7% in both the 122-car and the 36-car tests. No significant differences in carbon monoxide or nitrogen oxide emission levels were observed. Photochemical reactivity levels were essentially the same for the leaded and unleaded car groups in the two tests. A limited study of the effect of mileage accumulation conditions on exhaust emission levels was carried out. Results obtained under rapid or accelerated mileage accumulation conditions did not correlate with consumer test results. (Author abstract modified)

19085

Davis, H. P., O. A. Uyehara, and F. S. Myers

THE EFFECTS OF KNOCK ON THE HYDROCARBON EMISSIONS OF A SPARK-IGNITION ENGINE. Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1969. 12 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690085.)

To determine the effects of knock in a spark ignition, single-cylinder engine with cooled exhaust upon the exhaust composition, exhaust products (CO, CO_2, and total hydrocarbons) were measured by non-dispersive infrared analyzers (NDIRA) and by a flame ionization detector (FID). Individual hydrocarbons were separated on a gas-liquid chromatograph. In fuel-rich mixtures, the FID indicated noticeable decreases in the hydrocarbon concentrations in the presence of knock. The NDIRA did not indicate a decrease in the hydrocarbons at knock of lower intensities but showed decreases in hydrocarbons at knock of higher intensities. Chromatograms indicated a preferential decrease in acetylene at the time of knock, causing different responses at lower intensities. In fuel-lean mixtures, no apparent effect of knock on the hydrocarbons was indicated. Thus, it was concluded that in fuel-rich to stoichiometric regions, knock generally decreases the hydrocarbon concentration in the exhaust and the extent of the decreases is greater with the intensity of knock. (Author abstract modified)

19074

Leggevie, G. and I. Skunca

SOOT FORMATION TENDENCY OF LP-GAS IN ATMOSPHERIC BURNERS. (Untersuchungen ueber die Russbildungsneigung von Fluessiggasen in atmosphaerischen Brennern). Text in German. Interm. E. Gasverserme, 18(3):122-123, March 1969. 3 refs.

Using the cooker burner of a multi-gas range, the authors determined the tendency to form soot when the range was supplied with hydrocarbon gases under equal pressure. The input of primary air was so adjusted as to cause incipient yellow flame tips to occur. The tendency to form soot increases in the order: propane, butane, propylene, and butylene.

19116

Huse, H. W.

AIR POLLUTION AND THE COMPRESSION-IGNITION ENGINE. Preprint, Combustion Institute, Pittsburgh, 14p., 1968. 9 refs. (Presented at The Combustion Inst. Twelfth International Symposium on Combustion, Poitiers Univ., France, July 14-20, 1968, Paper 61-7.)

The compression-ignition engine, popularly known as the diesel, is examined as a contributor to metropolitan air pollution. Smoke and odor are recognized as the primary targets of public

objection to the diesel, and factors relevant to the smoke and odor problem are discussed. Problems of diesel smoke are seen as readily manageable, but a satisfactory solution to the diesel odor problem is not yet available. Other pollutants, e.g., unburned or partially burned hydrocarbons, oxides of nitrogen, and carbon monoxide, are significant products of diesel combustion. Of these, only nitrogen oxides and possibly the aldehydes are typically discharged in quantities that in equivalent volumes may exceed the quantities discharged by spark ignition reciprocating internal combustion engines. Features unique to the diesel combustion process are discussed as factors relevant to generation or avoidance of objectionable pollutants. The high temperatures and oxygen availability in diesel combustion are seen as serious impediments to satisfactory reduction of the yield of nitrogen oxides, but they are favorable in holding concentrations of pollutants in other categories to acceptable low levels. To compound this advantage, the diesel has advantages both in fuel economy and in higher heat value of diesel fuel compared with lighter fuels. Thus, it would appear that diesel power offers an excellent opportunity for continued and expanded application to meet increasingly stringent clean air requirements. (Author abstract modified)

19128

Eisenhorst, H. and W. Dontenvill

CARCINOGENIC HYDROCARBONS IN THE SMOKE FROM CHARCOAL GRILLING. (Nachweis cancerogener Kohlenwasserstoffe in Rauch beim Grillen uber Holzkohlenfeuer). Text in German. E. Ernahrungsforsch., vol. 7(3):157-160, Nov. 1967. 5 refs.

The smoke which is formed during the charcoal grilling of bacon was analyzed for its content of polycyclic hydrocarbons. The following polycyclic hydrocarbons were found: fluoranthene, perylene, phenanthrene, pyrene, benzo(a)pyrene, benzo(e)pyrene, chrysene, dibenzanthracene, anthracene, and benzanthracene. The amount of carcinogenic benzo(a)pyrene in the smoke was 129 microgram/kg of grilled bacon, and it was assumed that the carcinogenic hydrocarbons in the grill smoke were produced by pyrolysis of the fat which dropped on the glowing charcoal. (Author summary modified)

19127

Stone, R. E. and B. H. Eccleston

VEHICLE EMISSIONS VS. FUEL COMPOSITION. Preprint, American Petroleum Institute, Montreal, Can.; Div. of Refining, 50p., 1968. 9 refs. (Presented at the Session on Air and Water Conservation, 33rd Midyear Meeting of the American Petroleum Institute Division of Refining, Philadelphia, Pa., May 16, 1968, Preprint No. 31-68.)

Reduction of evaporation losses from motor vehicles was investigated as a means of lessening the amount of pollutants reaching the atmosphere. The effect of fuel volatility and of front-end fuel composition on the quantity, composition, and

photochemical reactivity of vehicle emissions including both tailpipe and fuel-system losses were studied. In addition, the test variables included engine fuel-system features and ambient temperature, which was varied over a range of 20-95 F. Results of tests on eight 1966 model cars are given. Driving cycle and instrumentation typical of current practices for emission studies were used. Test results showed that at high ambient temperatures, a large reduction in evaporation losses accompanied a reduction in front-end fuel volatility. However, there was also a small adverse effect on exhaust emissions from volatility reduction. Reactive hydrocarbon emissions from evaporation were reduced substantially by either volatility reduction or saturation of light olefins. Light olefin reduction also reduced exhaust reactivity. Carbon monoxide emissions showed a small increase as fuel volatility was reduced, while nitrogen oxides and aldehydes showed no significant fuel effect. (Author abstract modified)

14961

Hall, C. A., A. E. Felt, and W. J. Brown

EVALUATING EFFECTS OF FUEL FACTORS ON STABILISED EXHAUST EMISSION LEVELS. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1969. 5 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690018.)

Single-cylinder engine studies showed that the severity of the test cycle used for deposit accumulation markedly affects the level of exhaust emissions obtained with stabilised combustion chamber deposits. These studies also show that the relative stabilised emission levels with non-leaded and leaded fuels vary significantly with the aromatic content of the base fuel. An extensive evaluation in three groups of passenger cars operated by their owners in normal service showed no significant difference between the stabilised emission levels obtained with commercial non-leaded and leaded fuels. A dynamometer engine test procedure was developed that simulates short-trip, city-type operation. The accelerated conidown procedure allows for rapid accumulation of test mileage. Use of this dynamometer procedure showed that a prototype highly aromatic non-leaded fuel produced a higher deposit stabilised emission level than that obtained with an average presently used leaded fuel. (Author abstract modified)

14962

Cagliardi, J. C. and F. E. Ghannam

EFFECTS OF TETRAETHYL LEAD CONCENTRATION ON EXHAUST EMISSIONS IN CUSTOMER TYPE VEHICLE OPERATION. Preprint, Society of Automotive Engineers, Inc., New York, 19p., 1969. 9 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690015.)

Effects of various concentrations of tetraethyl lead on exhaust emissions were investigated. Eight Ford Galaxies equipped with production non-exhaust emission-equipped 289-CID, V-8 engines were operated in customer service for 18,000 miles in the Detroit area. Four fuel blends were used in mileage accumulation. All

engines were operated on the same petroleum base engine lubricant. Exhaust emissions were monitored at approximately 3000-mile intervals using the California Motor Vehicle Pollution Control Board seven-mode procedure. Additional seven-mode tests were obtained on each engine after combustion chamber deposits were removed at the completion of the mileage accumulation phase. The increase in exhaust hydrocarbon emissions of vehicle operation on the leaded fuels was substantially higher than the hydrocarbon increase of vehicles operated on indolene clear (a full boiling range non-lead gasoline). At the 12,000 mile point, for example, the average hydrocarbon increase for the leaded fuels was approximately 100 ppm as hexane, while the hydrocarbon increase on indolene clear was negligible. No deleterious effect, due to the fuel used, was observed on any engine component. (Author abstract modified)

1968?

Shoji, H.; K. Nishida, M. Kusatsu, S. Yasuda, T. Benda, S. Takada, and A. Hasegawa

THE STUDIES ON THE AIR POLLUTION DUE TO AUTOMOBILE EXHAUST GASES (REPORT 12). TOTAL AMOUNT OF EXHAUST GASES IN KYOTO-CITY. Jidosha haiki ni yoru taiki osen no kenkyu (Dai 12 ho). Kyoto-shi ni okeru haiki seibun no hai shutsu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):92, April 1969.

A method for calculating total automotive exhaust gases in Kyoto is based on estimates of the average amount of exhaust gases per automobile per running cycle and the ratio between traffic density in center city and the surrounding areas. Assuming that (1) the ratio between center city and outlying traffic is 2.2 to 1.0; (2) the total number of cars varies between 200,000 to 300,000/day; (3) all have gasoline engines; and (4) the running cycle for center city is the DC type and for the circumferential area the HI type, the total amount of exhaust would be 124.0 to 127.2 tons CO/day and 17.8 to 18.8 tons of hydrocarbons per day for 200,000 cars and 186.0 to 190.8 tons CO/day and 26.8 to 28.2 tons of hydrocarbons per day for 300,000 cars.

1969

Cejka, Milan

DIESEL ENGINE EXHAUST GASES. (Vyfukove plyny z naftovych motoru). Text in Czech. Hops Uhlie, 9(6-7):208-211, 1967.

Composition of engine exhaust gases depends largely on the fuel-air ratio, which varies in accordance with the loading of the engine from 18:1 to 100:1, and this greatly influences the combustion process. In addition, the content of exhaust gases is determined by the shape of the combustion chamber, the type of fuel injection, whether the engine is two or four stroke, habits of the driver, etc. Analysis gave evidence of 47 different compounds in engine exhaust gas. Nitrogen oxides comprised 40-85% of the emissions from diesel engines compared to 10% from combustion engines. The content of aldehydes in smoke is the main cause of toxic effects in humans. It is believed that lighter fuels reduce smoke, but

they yield more irritant compounds. In a garage for 200 buses whose engines were in good condition, the measured concentration of carcinogens was 2.7 to 2.9 micrograms/100 cu m, which is less than values found in ambient air from burning coal. The setting of maximum allowable concentration standards is very difficult because of the wide range of individual reactions to engine exhausts. Reduction of pollution may be effected by supplying specially treated fuel with low sulfur content, after burning of gases as practiced in the U. S., and regular inspection of engines.

14680

Wagner, T. O.

COMPOSITION OF DIESEL EXHAUST HYDROCARBONS. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C.; National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 241-252.

The technology required to develop an odor standard for diesel engines is being acquired. However, diesel exhausts contain such a wide range of compounds that sampling and analytical procedures are difficult. When no more than an inventory of hydrocarbon compounds is desired, capillary-column chromatographic analysis of a bag sample is adequate, even though many 'heavy' hydrocarbons are lost. Such an analysis revealed the presence of C1 to C18 paraffins. Few, if any, of the light and mid-boiling compounds were present in the fuel. Compounds causing diesel odor are in the C8 to C18 range. Diesel exhaust contains many oxygenated compounds which may be relevant to odor, but their concentrations are low. The effect of fuel on diesel emissions is small. Concentrations of hydrocarbons in diesel exhaust, adjusted for excess-air dilution, are generally below passenger car emission standards.

14697

Rinkenich, R. E.

PARTICULAR PROBLEMS WITH EXHAUST GAS ANALYSERS AT VOLKSWAGENWERK AG. Preprint, Society of Automotive Engineers, Inc., New York, 12p.; 1968. 6 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680122.)

Emission and durability tests of 1968 Volkswagens are reported. Exhaust emissions from cars made in Europe and the United States were measured by a dynamometer and analyzed for hydrocarbon and carbon monoxide content by infrared and flame ionization detection methods. To determine if any correlation exists between present or proposed emission standards and test procedures, European, Japanese, and American tests were used to calculate exhaust gas flows and quantity of pollutants. Carbon monoxide concentrations in the European test procedure are 1.3 times higher than in the official U. S. test procedure. Concentrations of hydrocarbon in the European test procedure is

lower than in the U. S. procedure, reflecting the influence of deceleration which is more rapid in the U. S. test. If U. S. emission standards were based on mass emission rather than on concentration, mass emissions of carbon monoxide would be higher in U. S. test procedures. This is attributed to the relationship between carbon monoxide and exhaust gas volume. Higher average speed in the U. S. test results in a higher exhaust gas volume. Fuel consumption does not correlate significantly with emissions, but combustion tends to be better with the U. S. test procedure. Worldwide legislation on emission standards with one common test procedure is recommended.

19767

Markus, U. A.; Yu. U. Ozerskii, and V. I. Oratovskii

DISCHARGES TO ATMOSPHERE AT THE PHENOL WORKS. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.); no. 1:37-39, 1969. 9 refs.

The quantity and composition of discharges from the phenol works were determined. Discharges come from breather valves in operational equipment as a result of evaporation from equipment operating under a vacuum which discharges drawn-off gases, and from spent gas leaving the unit for springing sodium phenolates with carbon dioxide. The vacuum pump discharges contain hydrogen sulfide and ammonia. Impurities such as pyridine bases, phenols, neutral aromatic hydrocarbons, hydrogen sulfide, and ammonia enter the common collector. Measurements revealed that the volume of the gas-air mixture discharged to the atmosphere through the collector is 600-800 cu m/hr. Two-liter samples were taken over a 30-min period and analyzed. The fluctuations of the various contents were ascribed to changes in the composition of the raw materials that were processed and in the operating conditions of the plants. The maximum concentrations of the noxious discharges were calculated. The results indicated that the content of phenols, hydrogen sulfide, and other impurities exceeded the maximum standards and must be reduced 10-20 times. It was concluded that work should be done to reduce the volume of discharge by strict observance of the process conditions to ensure that minimum discharges and effective equipment be developed to trap noxious impurities.

19798

Liedmeier, G. P.

PREVENTION OF ATMOSPHERIC POLLUTION IN PETROLEUM REFINERIES. (La prevention de la pollution atmospherique dans les raffineries de petrole). Text in French. Pollut. Atmos. (Paris), 11(Special):3-8, Feb. 1969.

A review of atmospheric pollution and problems in controlling it in the refineries of Europe is presented. The author discusses the founding of CONCAWE (Conservation of Clean Air and Water--Western Europe), which is a group of oil companies and societies representing 80% of the refining capacity in Western Europe. Its functions are to process information pertaining to pollution

by refineries and the joint study of pollution problems. It now has working groups in the following areas: study of the height of chimneys and atmospheric dispersion; liquid effluents; petroleum pipelines; subterranean migration of petroleum; and noise abatement. The sources and effects of refinery pollution, particularly by sulfur oxides, hydrocarbons, and malodorous gases are reviewed. Particulate matter and nitrogen oxides are considered of secondary importance. A brief review of methods for combatting pollution is also included.

14892

Durrant, T.

TOWARDS CLEANER SKIES. Aeroplane, 116(2966):16, 20-21, Aug. 21, 1968.

The main contaminants produced by aircraft burning kerosene fuels are exhaust smoke, unburned hydrocarbons, carbon monoxide, and sulfur and nitrogen oxides. The presence of smoke in the engine exhaust is a failure to control carbon production or consumption processes or both, but experience has shown that elimination of smoke is difficult at increased engine pressure ratios. By changing combustion-chamber design and including airspray fuel injectors, it is expected that new large transport gas-turbine engines will have a barely visible level of smoke emission. Annular chambers now being introduced have a smaller flame tube wall surface area and therefore use less cooling air than the tuboannular system. Consequently, unburned hydrocarbon and carbon monoxide concentrations at idle and taxi conditions will be lower on new engines than on those currently in service. The most difficult contaminants to control are nitrogen oxides, although concentrations are low compared with the automobiles. Intensive investigations are being conducted to reduce these emissions; it is suggested that one method of reducing their concentration may be by running with a richer primary combustion zone, although this is contrary to smoke-control requirements and would involve design compromises.

15310

Friedlander, S. K. and J. H. Seinfeld

A DYNAMIC MODEL OF PHOTOCHEMICAL SMOG. Environ. Sci. Technol., 3(11):1175-1181, Nov. 1969. 19 refs.

A simplified kinetic scheme is proposed as a dynamic model for photochemical smog reactions. Unlike previous diffusion models, which have been concerned with nonreacting pollutants, the formulation of this model takes into account both the chemical reaction and turbulent mixing aspects of the photochemical smog problem. In the first part of the paper, a simplified kinetic mechanism is presented for the formation of photochemical smog from nitric oxide and unburned hydrocarbons. In the second part, diffusion models based on the general equation of conservation of species are discussed. The model is a combination of the transport and chemical kinetic equations and predicts the behavior of a reacting pollutant cloud. The roles of sulfur oxides and aerosols are not considered. Calculations based on the

model lead to concentration dependence on time, similar in form to the experimental results for laboratory reaction chambers. The Lagrangian similarity hypothesis for the diffusion of nonreactive components is extended to reacting species to take into account the effect of atmospheric mixing. This leads to a set of ordinary differential equations for the reactive species of the type describing a chemical reactor of variable volume. As a preliminary example of the application of the model, a calculation was made for a single bimolecular reaction.

15152

Scofield, Francis

AIR POLLUTION FROM SOLVENTS. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2):393, 1969. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

The organics and plastics coatings industries are among the major contributors to photochemical smog. A significant contribution arises from the evaporation of organic solvents. The reactivity of solvents varies over a wide range and a substantial reduction in the amounts of reactive materials contributed by solvent evaporation may be achieved without a corresponding reduction of the total solvents. The only effective way to date of establishing the relative reactivity of these compounds is an empirical method which exposes a mixture of the solvent and nitrogen oxides to irradiation. A number of photochemical reactors of this type are in operation and many of them provide for the direct determination of eye irritation. It is very difficult to predict reactivity of individual solvents, and since there is a wide variety of reactions which may take place, not all of which lead to eye irritation or other damaging products, even a high degree of reactivity is not necessarily an indication that a solvent is objectionable. An accepted order of reactivity by classes of compounds is that, in general, olefins are the most reactive and should be controlled at the lowest level. Aromatic compounds are less objectionable but still require control, while most oxygenated and aliphatic materials are relatively innocuous and under present conditions do not appear to require control. However, within each of these classes a wide range of reactivity can be encountered. More information in this area is necessary in order to guide the writing of future regulations and possibly the revision of current controls.

15167

Eberan-Eberhorst, H.

PROBLEMS OF EXHAUST GASES FROM OTTO ENGINES - RESULTS OF OTHERS AND ORIGINAL MEASUREMENTS. (Probleme der Abgase von Ottomotoren - Ergebnisse fremder und eigener Messungen). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 70(2):40-45, 1968. 19 refs.

Tests of the Otto engine on a dynamometer showed that all carbon monoxide and hydrocarbons can be easily eliminated in the load

and speed range of the engine. Only when the engine acts as a vehicle brake does the hydrocarbon (CH) content exceed 1000 ppm. Optimum spark timing and diminishing of the valve overlap reduces the idle rpm to 730 with a CH content of less than 1000 ppm. Above 1550 rpm, extremely high CH concentrations of more than 5000 ppm occurred. This phenomenon was studied in greater detail. For this purpose, the combustion pressure in the cylinder was induced, and PV diagrams were obtained with a piezo quartz pressure pick-off and a cathode ray oscillograph at 2000 rpm and slowly closing throttle valve. Initially the combustion was rather complete, as the emission concentrations of 0.15% CO by volume and CH less than 30 ppm, show. By further closing of the throttle valve, the pressure decreased from 4.0 to 0.20 kg force/sq cm, combustion became markedly irregular but still complete, and emissions decreased. At an underpressure of 400 mm Hg in the intake pipe, the engine began to act as a brake, but the emissions were still only 50 ppm CH. Upon closing of the throttle valve to 8 degrees, emissions increased to 8000 ppm CH. There are two ways to avoid high emission concentrations of CO and CH caused by misfiring; namely, by prevention of the development of toxic exhaust components in the engine, or by destroying the toxicants in the exhaust system. A review of the major methods developed by the various automobile manufacturers is given. In conclusion, a regulator is described which maintains a constant fuel supply and a constant underpressure in the intake pipe during all operating states.

15392

Dean, Samuel L. and Howard Wall, Jr.

ATMOSPHERIC EMISSIONS FROM HYDROCHLORIC ACID MANUFACTURING PROCESSES. Public Health Service, Durham, N. C., National Air Pollution Control Administration and Manufacturing Chemists Association, Washington, D. C., Pub. AP-54, 59p. Sept. 1969. 15 refs.

The basic characteristics of the manufacture of hydrochloric acid are presented, including growth rate of the industry, manufacturing processes, product uses, and the number of producing plants in the United States. The Mannheim, Hargreaves, and Laury processes are discussed with respect to their historical interest, even though the number of plants that use them is decreasing. The concentration of hydrogen chloride emitted to the atmosphere is usually less than 0.5% of the tail gas volume emitted to the atmosphere. Emissions from hydrochloric acid plants are adversely affected by high temperatures in the absorption system, improper balance of absorption area and contact time, faulty equipment, and inadequate tail gas scrubbing systems. No correlation exists between exit gas volumes and plant production rates because of the diverse methods of production. However, smaller volumes of exit gas usually show greater hydrogen chloride concentrations due to the varying amounts of inert materials in this gas stream. Thus, the amount of hydrogen chloride emitted in pounds per ton of acid produced gives a more accurate description of the contaminant emissions. The hydrogen chloride emissions are usually reduced by scrubbing in a packed tower located behind the process tower. Water scrubbers can reduce the concentration to less than 0.1 pound per ton of acid produced. Hydrogen chloride absorption systems

include falling film and adiabatic absorbers. Other contaminants such as chloride, chlorinated organic compounds and other hydrocarbons emitted to the atmosphere are mentioned.

15199

NATURE AND CONTROL OF AIRCRAFT ENGINE EXHAUST EMISSIONS. Northern Research and Engineering Corp., Cambridge, Mass. Contract FH22-68-27, Report 1114-1, 108p., Nov. 1968. 208 refs.

The results of a study of the emissions of air pollutants by aircraft engines in the U. S. are presented. The study included four aspects of aircraft engine emissions: the nature of aircraft engine emissions and quantities emitted, the effects or impact of aircraft engine emissions on the populace, the reduction of emissions, and governmental control of the emissions. In addition, emission control requirements were considered and guidelines developed for determining the degree of control needed. The principal conclusion drawn from the study is that the nature and extent of air pollutant emission by aircraft can be assessed with sufficient accuracy to allow a comparison between aircraft and other emissions sources. On that basis, aircraft are a small contributor of pollutants in metropolitan areas. In the vicinity of air terminals, however, the density of pollutant emission by aircraft and the resulting pollutant concentrations are comparable to emission densities and concentrations in adjacent communities of the same pollutants from other sources. Thus, the principle impact of aircraft is local in nature and is expected to become more severe in future years. It is also likely that aircraft emissions will constitute a more significant portion of community-wide pollutant loadings as new aircraft are introduced and as emissions from other sources are reduced. It is further concluded that whenever a reduction of aircraft emissions becomes desirable, a variety of practical approaches exist to reduce both the quantities of pollutants emitted and their impact on the community. Specific conclusions relative to emission reduction and emission control are presented. A program of activity with regard to aircraft emission is recommended. All emission data is tabulated.

15769

Pursall, B. E.

POLLUTION IN ROAD TUNNELS. Consulting Eng., 33(8):57-58, Aug. 1969. 9 refs.

The sources and causes of the build-up of pollutants in road tunnels are discussed. The two main sources of poisonous exhaust gases are gasoline and diesel engines. Diesel exhaust emits a smaller percentage of carbon monoxide than the gasoline engine, but because the diesel engine is larger, it emits a larger volume. The diesel engine also produces more nitric oxide and nitrogen peroxide. Vehicles emit up to 50% more carbon monoxide on the up-gradient than on the level; on the down gradient, they emit 50% less. In calculations for two-way tunnels, an average figure for carbon monoxide emission can safely be taken. Tests showed that the amounts of carbon monoxide and other combustion

products vary directly with speed. Differences in tunnel concentrations for the Sumner Tunnel in Boston and the Central Tunnel in London were attributed to different vehicle speeds and variations between British and American vehicles and fuels. The variations resulted in higher concentrations of lead and hydrocarbons in the Sumner Tunnel; carbon monoxide concentrations were similar for average daytime periods in both tunnels. The effects of carbon monoxide, nitrogen oxides, and lead compounds are briefly discussed. It was concluded that if the concentration of CO can be diluted to below 100 ppm, the concentration of nitrogen oxides and other gases should be relatively harmless. Visibility should also be satisfactory under these conditions. In a 2 way tunnel, the maximum ventilation rate was calculated to be 200 cu ft/min/ft. With one way traffic, ventilation is induced from the portals by the moving vehicles, but additional artificial ventilation would be necessary when the traffic is stopped or moving slowly. In most large tunnels, alarms operate if the CO concentration exceeds 250 ppm.

15881

Winkler, G. L., S. S. Lentz, W. E. Meyer

EXHAUST GAS SAMPLING TECHNIQUE FOR RELATING EMISSIONS AND CYCLE CHARACTERISTICS. Preprint, Society of Automotive Engineers, Inc., New York, 5p, 1968. 10 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680770.)

For investigating whether or not there is a correlation between the irregularity of combustion processes in spark engine ignitions and undesirable emissions, a sampling system was developed which collects bag samples from specified cycles only. It consists of an analog portion for obtaining pressure and rate-of-pressure change signals, a digital logic portion for discriminating between signals according to selected criteria, and an electrically actuated sampling valve in the engine exhaust system. Since signal analysis and discrimination are instantaneous, gas sampling is done during the exhaust stroke of the same cycle for which the logic generated the command to sample. An analysis of the total unburnt hydrocarbons from 600 bag samples shows that there is a separation in the amount of unburnt hydrocarbons according to the magnitude of the peak rate of pressure change. The separation is repeatable for a given engine condition and supports the assumption of a relationship between exhaust gas composition and the physical characteristics of the cycle. (Author abstract modified)

15996

Campbell, Frank Leslie and Willis Conrad

INSECTICIDE COMPOUND AND METHOD OF DISPENSING AN INSECTICIDE. (Assignee not given.) U. S. Pat. 2,381,257. 2p., Aug. 7, 1945. (Appl. July 28, 1941, 1 claims).

The invention provides an insecticide in a liquid or solid form which decomposes at atmospheric pressure and room temperature, to release a toxic gas for the destruction of insects. The method

consists of exposing insects to a compound of sulfur dioxide and acetone which decomposes to release sulfur dioxide and acetone vapors in a toxic volume. Other compounds for use as insecticides include SO_2 and ethylene oxide, SO_2 and dioxan, SO_2 and trimethylamine, SO_2 and triethylamine, and SO_2 and dimethylaniline. The invention makes it possible to pack and ship sulfur dioxide in a readily usable form.

16017

Kurtzweg, J. A. and D. W. Weig

DETERMINING AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SYSTEMS. Preprint, Association for Computing Machinery, New York, N. Y., 22p., 1969. 18 refs., (Presented at the Association for Computing Machinery, Symposium on The Applications of Computers to the Problems of an Urban Society, New York, Oct. 28, 1969.)

Internal combustion vehicles are a source of five major air pollutants: carbon monoxide, hydrocarbons, nitrogen oxides, particulates, and sulfur oxides. Because vehicular pollution is essentially a problem of urbanization, analysis of its source must be carried out on a metropolitan or smaller scale. A method is presented for estimating the quantity and spatial distribution of motor vehicle emissions in a metropolitan area from established speed-emission relationships and transportation study data. On-the-road sampling of exhaust emissions from a representative sample of automobiles indicates there is a consistent relationship between average route speed and the quantity of carbon monoxide and hydrocarbons emitted. Metropolitan transportation study agencies developed detailed descriptions of future street and highway networks. The Seattle, Washington, metropolitan area was selected for the initial application of the vehicle emission estimation method because of the transportation characteristics of the area and the nature of the transportation study data available. Emissions are calculated for two 1985 street and highway networks, one based on the land use pattern predicted if existing trends within the region continue, and one based on a pattern which will exist only if certain development policies are implemented. The calculated vehicular emissions and estimated emissions from non-vehicular sources can be used with a meteorological diffusion model to predict future air quality. (Author abstract modified)

16024

Styles, H. E., J. Vrebos, and J. Lawther

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES. Preprint, World Health Organization, Geneva, Switzerland, 36p., Aug. 10, 1966. 8 refs. (WHO/AP/67.28.)

Diesel and gasoline engines are compared with regard to differences between their design and operating characteristics and differences between their exhaust products. Satisfactory combustion in a diesel engine does not require the production of an explosive admixture of vaporized fuel and air. Complete combustion is largely a matter of ensuring a correct pattern of

fuel spray from injector nozzles and a suitable degree of air swirl by proper combustion chamber design. In a diesel working at rated capacity, an excess of oxygen is always present during combustion and, in a properly maintained engine, the exhaust seldom contains more than mere traces of carbon monoxide, even though a haze of smoke is produced. As shown by analyses of smoke from intentionally maladjusted engines, diesels are not a major source of polycyclic hydrocarbons. While diesel soot has produced tumors in laboratory animals, no excess of lung cancer has been found among workers exposed to diesel exhausts. Diesel engines can be developed which meet emission standards such as those contained in the Belgian Royal Decree of 1964. Properly adjusted and maintained, these engines will not emit dangerous or dirty smoke. The use of smoke meters is recommended to check diesel smoke. Included in the appendix are measures taken to reduce air pollution by diesel buses and coaches in London.

16125

Rasek, V.

DEPOSITION OF COAL AND PITCH DUST ON AND AROUND COKE OVENS. Koks i Khim.) (English translation from Russian of: Koks i Khim.), vol. 9:29-31, 1969.

The results of investigations on the amounts of dust, the composition, and the method of dissemination in pitch-coke batteries and coke oven batteries was described. Most of the dust deposited on the pitch-coke batteries was in the form of spherical particles with a minimum diameter of 0.1-0.5 micron. The majority of the dust particles which settled on coke-oven batteries had a characteristic crystalline structure. Samples of dust deposited on the top of and in the vicinity of five coke-oven batteries were analyzed. No striking differences were obtained under winter and summer conditions. Homogeneous samples were collected to determine the contents of vitrain, clarain, durain, fusain, coke, and other constituents. It was established that the major component is vitrain. Results showed that with increasing distance from the battery, the deposits contain larger proportions of particles below 0.2 mm and smaller amounts of 3,4-benzopyrene. The highest content of 3,4-benzopyrene was found in the pitch and dust on and around coke-oven batteries. The amount of dust deposited on the coke-oven batteries depends on the charging procedure. Observations showed that rammed reduces dust emissions and loose charging increases the emissions. The results support the conclusion that strict adherence to battery operating instructions secures a major reduction in dust pollution. A further improvement can be effected by adopting the smokeless charging technique.

16135

Hashimoto, Michio and Manabiro Fujiwara

EFFECTS OF AUTOMOBILE EXHAUST GAS EMISSION ON AIR POLLUTION. (Jidoshahaikigasu no taikiosen eno eikyo). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 23(11):1151-1161, 1969. 25 refs.

In 1966, automobile production in Japan was almost 4,100,000 cars, a million more than produced in West Germany, and second only to the United State's production of 11,000,000 cars in the same year. While the United States, West Germany, France, England, and Italy show no annual increase, automobile production in Japan is increasing at an annual rate of 25-30%. If this rate is maintained, the approximate annual output should match that of the United Stated by 1976. It is difficult to imagine the extent of pollution by automobile engine exhaust when automobile production in a country approximately the area of California approximates that of the United States. Based on the results of measurements in several cities, the following aspects of pollution by automobile exhaust are discussed in detail: carbon monoxide emissions; dust fall including lead and pyrene; photochemical contaminations; hydrocarbon emissions; and odors. The toxicity of air pollutants for humans and vegetation is also examined. Although work on carbon monoxide began late in Japan, air quality criteria are now being formulated with respect to carbon monoxide. Air pollution from automobile exhaust is found to be increasing by approximately 10-15%. It is hoped that control policies will be in effect before automobile production reaches one car for every two individuals.

16261

Ludwig, John H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint, Assistant Commissioner, Science and Technology, Washington, D. C. 6up., 1970. 27 refs.

The contribution of motor vehicle emissions to community-wide air pollution problems depends on several related factors: the extent of community, commercial, and industrial sources as compared to vehicle sources; the size of the community and the distribution of these sources; topographical and meteorological factors; and the degree of control exercised for sources. The relative importance of motor vehicle emissions can be approached by evaluating specific effects, specific pollutants, and sources with respect to pollutant emissions of all types. Average emissions by sources are presented for Los Angeles County, Louisville, Detroit, and 11 Pennsylvania counties. Sources of gaseous emissions from motor vehicles are reviewed, as well as the sources of hydrocarbon and smoke emissions from diesels. California standards are reported for vehicle smoke and odor emissions, carbon monoxide, and nitrogen oxides levels. Also reported are 1970 Federal standards for exhaust emissions from automobiles and light trucks. An attempt is made to assess specific hydrocarbon constituents in gasoline engine exhaust, crank case ventilation, and evaporation losses, and diesel exhausts and their relationship to photochemical reactions occuring in the atmosphere. The need of continued laboratory research and detailed examination of exhausts produced by control devices is stressed.

16298

Fiala, Ernst and Ernst-Georg Zeschmann

ANNOYANCE CAUSED BY ODOROUS EXHAUST GASES. (Laestigkeit von Abgasgeruch). Text in German. VDI (Ver. Deut. Ing'.) Z. (Duesseldorf), 109(28):1139-1141, 1967. 5 refs.

The intensity of odors caused by automobile exhaust gases was evaluated by measuring the odor intensity of dilutions of the exhaust gas with fresh air that exceeded the odor threshold. The tests were performed with a water-cooled four-cylinder, four-stroke Otto engine. The measurements were based on the following considerations. At low traffic density i.e., on well-ventilated streets, the exhaust gas odor is not noticeable; the odor threshold is not reached. With increasing traffic density, i.e., less ventilation, odor threshold is exceeded. The mass flows emitted under the latter condition were indicative of the dilution which was the measure for the odor intensity. The results showed the familiar independence of carbon monoxide and hydrocarbon concentrations from engine operating state. Test personnel could smell the exhaust gas independently of the operating state at 600- to 1000-fold dilution. The carbon monoxide and hydrocarbon concentrations at the moment the odor threshold was exceeded were between 1 and 100 ppm and 0.6 to 8 ppm, respectively. Addition of air in the exhaust system reduced the concentrations, but increased the odor intensity.

16318

Risebrough, Robert and Virginia Brodine

MORE LETTERS IN THE WIND. Environment, 12(1):16-26, Jan.-Feb. 1970. 15 refs.

The accidental release to the atmosphere of toxic polychlorinated biphenyls (PCB) is discussed. Like DDT, PCB contains chlorine, hydrogen, and carbon; is soluble in fat and insoluble in water; and is extremely persistent in the environment. It is found in natural and synthetic rubber, electrical products, floor tile, printer's inks, coatings for paper and fabrics, brake linings, paints, varnishes, asphalt, adhesives, and resins. In addition, PCB is used to suppress the vaporization of chlorinated insecticides. Its detection began in 1967 with the identification of 1000 ppm PCB in the fat of North American peregrine falcons and 17,000 ppm in the fat of Swedish white-tailed eagles. It is unlikely that the insecticide is the only source of contamination. Other suspected sources are stacks of the plant manufacturing polychlorinated biphenyls, industrial wastes, and the gradual wear and weathering of PCB-containing products. Little data is available about PCB in people, but a sampling of mothers' milk in Berkeley and Los Angeles showed average concentrations of 0.06 ppm of whole milk. Small amounts were present in a sample of cow's milk and higher concentrations in fish eaten by humans. Establishment of tolerance limits of PCB in food is clearly essential. It is also necessary to identify the sources of the environmental PCB residues and to trace the paths by which they move through the environment.

16152

Dei Vecchio, V., P. Valori, C. Melchiorri, and A. Grella

AROMATIC POLYCYCLIC HYDROCARBONS FOUND IN THE EXHAUST GASES OF ENGINES RUN ON GASOLINE AND LIQUEFIED PETROLEUM GAS. (Idrocarburi policiclici aromatici nei gas di scarico di motori alimentati a benzina e a gas liquido). Text in Italian. Nuovi Ann. Igiene Microbiol (Rome), 20(2):179-190, March-April 1969. 33 refs. (Presented at the Symposium on the Chemical Aspects of Air Pollution, Cortina d'Ampezzo, July 9-10, 1969.)

Liquefied petroleum (LP) gas is seldom used for motor vehicles on the highway, even though its use would reduce air pollution problems, but is used in industry and commercial establishments to operate the motors of lift trucks for loading, unloading, transporting, and stacking goods. A series of experiments were made with a Towmotor diesel lift truck, type 452 HP, with a 4-cylinder continental motor, 2400 rpm, lifting power 2000 kg. The truck was operated for a total of 8450 hours during the experiment. The fuels used were 84 RO gasoline and propane-butane (LP gas). It was operated under simulated operating conditions with a load of 1000 kg as well as in an idling state at approximately 500 rpm. The exhaust gases were collected, dried, and filtered through glass wool and cellulose triacetate. Aspiration was by means of a vacuum pump, with a constant flow of 2813 l/h. Extracts were prepared in a Soxhlet apparatus with cyclohexane for a period of 20-30 hours. The extract was adsorbed in a column of alumina and separated chromatographically. Quantitative determinations of aromatic polycyclic hydrocarbons (APH) were made by spectrophotometry. The gasoline exhaust contained 19 identifiable APH, some of which were known to be carcinogenic. The LP gas exhaust contained 18 APH. Qualitative differences were very slight, but the APH emissions from the gasoline exhaust were considerably higher in quantity, with the exception of fluorene, anthracene, and antanthrene. Tests with an idling motor at 500 rpm produced considerably less concentrations of the individual hydrocarbons for both fuels, with the exception of naphthalene.

16494

Akamatsu, Isao, Hiroshi Kamishima, and Yutaka Kimura

DEODORIZATION OF EXHAUST GAS IN KRAFT PULPING. (PART I). ON THE FORMATION OF MALODOROUS COMPONENTS IN KRAFT PULPING. (Kuraftu-parupu seizo katei haishutsu gasu no mushuka (1 ho): Jokai-chu ni okeru akushu-seibun no seisei ni tsuite). Text in Japanese. Kami-pa Gikyoshi (J. Japan Tech. Assoc. Pulp Paper Ind.), 22(8): 406-410, Aug. 1968. 3 refs.

The formation of malodorous substances, methy mercaptan (MMA) and dimethyl sulfide (DMS), in the process of kraft pulping was studied in two types of Japanese pulp woods: softwoods (red pine, cedar and Japanese cypress) and hardwoods (beech, poplar, cherry and pasania oak). Alkaline (Na2O) and sodium sulfide (NaS) were added to a 400 g dried pulpwood block in an electric autoclave and boiled for 5-1/2 hours at 169 C. Then 5 cc of exhaust gas (raw blow gas) was sent into the cyclone-separator (a cylinder with the diameter

of 3 cm and the length of 18 cm) and analyzed for malodorous substances (MMA and DMS) by the use of Yanagimoto GCG-5DH type gas chromatograph. Larger amounts of MMA and DMS, especially MMA, were produced by pulping hardwoods than by pulping softwoods. In pulping the same wood type, the amount of malodorous substances was increased with the increase of cooking hour and temperature, and the concentration of NaS. The white lauan produced the same malodorous substances in quality and quantity as obtained in the pulping of Japanese hardwoods. When the pulping was performed by a batch system, the concentration of DMS was decreased to trace with the depression of pressure in the autoclave.

16498

Reuser, A. H.

TRENDS IN AIR CONSERVATION IN THE GRAPHIC ARTS INDUSTRY. Gravure, 1969:22-25, 45-48, Feb. 1969. (Presented at the Fifth Graphic Arts Conference of the Technical Association of the Pulp and Paper Industry, Chicago, Nov. 1968.)

The main sources of pollution from processes involving printing and coating operations is exhaust from ovens and dryers. The principal contaminants are hydrocarbons from the solvents used in the inks and coatings. In addition, there can be some hydrocarbon residue from incomplete combustion of the fuel in flame dryers and ovens. Odors are also a problem, attributed to complex organic products of cracking and partial oxidation of resinous materials in solvents. In general, the solvents themselves are not responsible for odor complaints. Solvent emissions can be limited by direct-flame incineration or catalytic combustion, the latter technique being the more economical. Because of the possibility of catalyst poisoning or suppression, catalytic combustion may not meet Los Angeles air pollution regulations limiting solvent emissions to a maximum of 8% olefins and 20% toluene. Direct-flame ionization has been approved by the Los Angeles Air Pollution Control District. A newer approach to curtailing emissions from graphic art processes involves the use of inks and coatings which do not pollute air or require expensive effluent treatment. Ways by which this goal might be met are examined.

16526

Wheatley, G. A. and J. A. Hardman

INDICATIONS OF THE PRESENCE OF ORGANOCHLORINE INSECTICIDES IN RAINWATER IN CENTRAL ENGLAND. Nature, 207(4996):1006-1007, July 31, 1965. 5 refs.

Rainwater samples collected from a locality in central England were analysed for organochlorine insecticides by both thin-layer and gas/liquid chromatographic techniques. Quantitative estimates (90% for dieldrin, 70% for gamma benzene hexachloride (BHC), and 50% for DDT) were obtained by comparing the peak heights on the gas chromatograms of samples extracted with hexane with those given by standards prepared from analytical grade specimens of the insecticides. All the rainwater samples examined yielded solutes identical in behavior to gamma-BHC and dieldrin in both the thin-layer and gas/liquid chromatographic systems. A solute corresponding to the behavior of p,p' DDT was also detected.

The concentrations of the solutes varied from month to month and appeared to be independent of the total monthly recorded rainfall. It is concluded that apparent increases in residues in untreated droplets could not be accounted for by fallout of insecticide in the rain, since calculations showed that one part of solute could deposit only 2.7 mg of solute per acre for a 24-in. annual rainfall.

C. ATMOSPHERIC INTERACTION

00139

E. R. Allen and R. D. Cadle

A STUDY OF THE EFFECT OF MOLECULAR OXYGEN ON ATOMIC OXYGEN-HYDROCARBON REACTIONS. Photochem. Photobiol. 4, 979-87, 1965.

Investigations of the systems atomic oxygen-methane and atomic oxygen-n-butane have been made, using techniques for producing atomic oxygen in the presence and absence of ground state molecular oxygen. The results indicated that the initial rate of removal of atomic oxygen from both systems was accelerated by the presence of molecular oxygen, whereas the initial rate of removal of hydrocarbon, for n-butane, was affected little if at all.##

00173

R. J. Engelmann, R. W. Perkins, D. I. Hagen, and W. A. Hailer

WASHOUT COEFFICIENTS FOR SELECTED GASES AND PARTICULATES. Battelle Memorial Inst., Richland, Wash.; Pacific Northwest Lab. (BNWL-SA-657.) (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-118). 11 pp.

Precipitation scavenging is the primary cleansing mechanism for airborne gases and fine particulates. Scavenging below cloud base, called washout, acts to remove these from pollution clouds. Advances in radiochemical techniques allow the measurement of such washout coefficients during natural rain and snow. Washout coefficients (fraction washed out per unit time) are presented for several gases as a function of precipitation rate. Deviations from theoretical predictions are discussed.##

00177

H. Buchberg, H. H. Jones, R. G. Lindh, and R. W. Wilson

AIR POLLUTION STUDIES WITH SIMULATED ATMOSPHERES. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 61-44.) July 1961. 185 pp.

Part I of this report deals with the statistical relations among interacting atmospheric variables. Also contained in this report are the results of several auxiliary or supporting studies as follows: Air Purification Studies; Development of an Eye

Mask for the Measurement of the Threshold of Eye Irritation; Development of an Omnidirectional Solar Radiometer for a Limited Spectral Region Centered about 0.36 microns; A Comparison of Concentration and Duration as Measures of Threshold for Eye Irritation; A Comparison of Threshold to Eye Irritation Resulting from Reacted Air Mixtures Sampled at Different Points in the Exposure System; A Comparison of Odor Threshold and Eye Irritation Threshold for Formaldehyde, Acrolein, and Ozone. (Author)##

00242

W.W. Heck, C.S. Brandt, J.A. Dunning, F.L. Fox

ECOLOGICAL FACTORS INFLUENCING PLANTS AS MONITORS OF PHOTOCHEMICAL AIR POLLUTION. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-98.)

The response of plant systems to the oxidant complex of the air must be interpreted in terms of the influence of the total environment. Photoperiod, light intensity, carbon dioxide concentration, soil conditions, time of day, plant age, and frequency of exposures affect the response of pinto bean and tobacco to ozone. Tobacco is suggested as a relatively simple monitoring system for obtaining some data on photochemical pollution. (Authors' abstract)##

00302

A. P. Altshuller

ATMOSPHERIC REACTION STUDIES RELATED TO AIR POLLUTION. Arch. Environ. Health 8, 87-10, Jan. 1964.

Studies of air pollution in urban and adjacent rural areas by particles and trace gases need to be related to studies of composition of the earth's atmosphere. Man's activities generate pollutants which in themselves or through photochemical reactions contaminate the general atmosphere. Cooperative efforts need to be made by air pollution and atmospheric science laboratories to obtain monitoring data. Areas of such research in measurement of pollutants and nonpollutants, measurement methods, instrumentation, and biological and chemical effects are reviewed by the author. The proper selection of synthetic atmospheres for laboratory studies so that real conditions are reflected is emphasized. An important problem still requiring solution is the obtaining of support, personnel, and facilities for research and development on instrumentation for specialized applications.##

00346

W. L. Faith

RELATIVE REACTIVITY OF HYDROCARBONS IN PHOTOCHEMICAL SMOG FORMATION AND ITS PRACTICAL IMPLICATIONS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control

Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-90.)

Adequate and intelligent control of photochemical smog requires a knowledge of the relative reactivity of the hydrocarbons emitted from motor vehicles and a method of measuring them. An extensive survey of the literature yields the following general classification of hydrocarbons: (1) reactive (all olefins and all aromatics except benzene and toluene) and (2) nonreactive (all paraffins, acetylene, benzene and toluene). Within the olefin series, there is a wide range of reactivity; ethylene is far less reactive than other olefin species. In fact, ethylene provides a good line of demarcation between reactive and unreactive compounds, so far as photochemical smog formation is concerned. A simple method of analysis that will distinguish between reactive and non-reactive hydrocarbons is sorely needed. At present, an instrument that would distinguish between olefins and nonolefins would be useful. (Author)##

00145

J. C. Romanovsky, H. H. Ingels, and H. J. Gordon

RETARDATION OF SMOG EFFECTS IN THE HYDROCARBON-NITRIC OXIDE SYSTEM. Preprint. (Presented at the Air Pollution Control Assoc. Annual Meeting, June 20-24, 1966, San Francisco, Calif.; Paper No. 66-92).

The complex role of nitric oxide in photochemical smog has led to conflicting conclusions concerning its relationship to end effects. The confusion has not been dispelled by the tendency to employ kinetic parameters of the photochemical reactions accompanying the formation of smog as indicators of the end effects. In an attempt to resolve these differences a detailed study was carried out to examine the effects of varying the concentrations and reactant ratios of NO and "hydrocarbon" on a number of smog effects as well as on various functions of the reaction rate. Hydrocarbon components increasing in complexity from propylene through a simulated auto exhaust to authentic auto exhaust were irradiated in the presence of NO in large chambers instrumented for measurements of numerous variables. Eye irritation was measured using a selected panel of human subjects; formation of ozone and formaldehyde was followed analytically. From other analytical data it was possible to derive half-lives for NO, NO2, and hydrocarbon, as well as maximum reaction rates for propylene, either as the sole hydrocarbon or as a component of the exhaust. The various dependent variables are presented as functions of the reactant concentrations by means of contour diagrams derived by computer treatment. The effect of "hydrocarbon" and NO levels on smog effects are discussed; the observed relationships between end effects and reaction rates are considered. The study simulated the effects of varying degrees of vehicular emissions control over one or both reactants and has a bearing on the establishment of vehicle emission standards in California. (Author)##

00451

J.P. Detrie

(METHODS AND TECHNIQUES CARRIED OUT IN FRANCE IN THE FIGHT AGAINST ATMOSPHERIC POLLUTION.) Methodes et Moyens en Oeuvre en France pour Lutter contre la Pollution Atmospherique. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) No. (5):207-217, May 1966. Text in French

Legislative proposals put into effect in the Paris region over the last five years are reviewed. There is a close liaison established between private organizations, representing the hygiene specialists and private industry and public powers. Studies carried out to determine the extent of pollution, that is, emission, dispersion, type of environment and its effect on pollution, demonstrated the problems involved with means of combating pollution. The solution cannot be found in generalized formulas which are too often recommended, and which mask the detailed effort necessary to obtain good carburation and combustion of fuels and proper construction of buildings and equipment. (Author summary)**

00465

A.P. Altshuller

AN EVALUATION OF TECHNIQUES FOR THE DETERMINATION OF THE PHOTOCHEMICAL REACTIVITY OF ORGANIC EMISSIONS. J. Air Pollution Control Assoc. 16(5):257-260, May 1966.

The concept that control of organic substances in emissions should be based on the relative ability to cause the effects associated with photochemical air pollution (reactivity) rather than on gross emission levels has gained wide acceptance. Two general types of reactivity response scales have been proposed. One of these is based on rates of hydrocarbon reaction or nitrogen dioxide formation. This scale covers a wide range because of the very high rates associated with olefins having internal double-bonds. The other scale is based on product yields combined with biological measurements. This type of scale is considered superior to one based on rates. This latter scale covers a narrow response range because olefins with internal double bonds have only slightly higher product yields and biological effects than do other reactive olefins and alkylbenzenes. Use of a response scale based on product yields and biological effects also permits use of less detailed instrumental procedures. A simple subtractive column technique combined with a flame ionization analyser should be sufficient to estimate hydrocarbon emissions. Gas chromatographic analyses of hydrocarbon emissions are of value when used with either type of reactivity response scale. However, detailed gas chromatographic analyses are essential for a response scale based on rates. The response scale based on product yields and biological effects indicates much less improvement in reactivity from fuel composition changes than would be predicted from a response scale based on rates. The most desirable approach is to use a variety of control and engine modification techniques to reduce all reactive organics to the lowest level possible.**

00502

W. J. Hanning, W.G. MacBeth, R.L. Chass

THE PHOTOCHEMICAL AIR POLLUTION SYNDROME AS EXHIBITED BY THE ATTACK OF OCTOBER 1965. Arch. Environ. Health., 14(1):137-149, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The photochemical air pollution syndrome which occurred on the days of October 26, 27, 28, 1965, was typical and it followed the pattern set by previous smog attacks. These factors are: (1) low wind speeds to concentrate the pollution in one area, (2) low inversion heights so that little vertical mixing can occur to dilute the emitted materials, (3) a trajectory which carries the emitted pollution to Los Angeles Civic Center and to Pasadena and Azusa or Burbank in the afternoon, and (4) sufficient sunlight to photodissociate the NO2 formed, and to form nitric oxide and atomic oxygen. The results are high oxidant or ozone and large quantities of sub-micron size particles. In addition, eye irritants and "plant damaging" chemicals are formed. Some of these are, it is believed, formaldehyde, acrolein, PAN, chemical free radicals, other nitrates or nitroso compounds, and a peroxyformyl activated complex. Authors present sixteen (16) charts and tables to substantiate the events in this air pollution episode. They include meterology, concentrations of various oxidants, pulmonary blow resistance, and variations in eye irritation.##

00510

R. Neiburger

METEOROLOGICAL ASPECTS OF AIR POLLUTION IN RELATION TO BIOLOGICAL RESPONSES. Arch. Environ. Health 14(1):41-45, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This report presents a brief review of the meteorological aspects of air pollution, as a background for the implications they have on biological and medical effects. The meteorological factors enter because they determine the rate of diffusion of pollutants, and thus the concentrations of contaminants in the air, given the configuration and intensity of the sources. The two factors which enter are the wind velocity and the vertical temperature gradient or lapse rate. Meteorological considerations will have to enter into the final determination of the air purity standards which will have to be set. Much research will be needed regarding the rates of diffusion from line and area sources, and especially the rates of removal of pollution. Much data will be required to define the air pollution potential of regions throughout the world. But we cannot await the answers to this research before requiring controls to the full extent presently feasible. Regulations are needed to enforce limiting every emission into the atmosphere to the lowest possible level, at the same time as we push research and development programs seeking means of reducing further the contamination of the atmosphere.##

00607

J.N. Pitts, Jr., J.K. Foote, J.K.S. Wan

SOME CORRELATIONS BETWEEN SPECTROSCOPIC AND PHOTOCHEMICAL PROCESSES. Photochem. Photobiol. Vol. 4:323-333, 1965. (Presented at the Photochemistry and Photobiology Symposium, Fourth International Congress of Photochemistry and Photobiology, July 26-30, 1964, Oxford, England.)

By applying the modifier 'space' to the terms 'Photochemistry' and 'Spectroscopy' one implies a concern with electromagnetic radiation of wavelengths less than that found at the earth's surface and with energetic particles, particularly electrons. It has been observed that for certain classes of organic compounds useful empirical correlations exist between reactions induced by electron impact, non-ionizing ultraviolet radiation and ionizing radiation. These correlations allow qualitative or semi-quantitative predictions of specific reactions and/or reaction mechanisms which will occur during photolysis or radiolysis, based on known optical or mass spectra. In accord with recent spectroscopic evidence, benzene and toluene do not significantly react photochemically in their first absorption band (at about 2500 angstroms); however, they react with a quantum yield approaching unity in their second and third absorption bands (at about 2000 and 1850 angstroms respectively). The products of this decomposition are primarily carbon and/or polymer which deposit on cell windows, however, small yields of stable products have been isolated. Another example of this extrapolation from one technique to another deals with the correlation of cyclic elimination reactions observed in the mass spectra, photochemistry and radiation chemistry of various classes of organic compounds. Classic examples of this type of reaction are the photolytic and radiolytic elimination of olefins from esters and ketones having a hydrogen gamma to the carbonyl group (i.e., the elimination of ethylene from ethyl acetate and of propylene from methyl n-butyl ketone). Based on mass spectral correlations with the above reactions, the same type of elimination should be expected from a great number of compounds which contain hydrogens gamma to unsaturated groups. In those cases where the photochemistry or radiation chemistry of these compounds have been studied, an intramolecular cycloelimination of olefin has been observed to be an important process. It is suggested that mass spectra are a useful diagnostic tool for at least gross predictions in 'space photochemistry' and 'space photobiology', as well as in considering reactions of importance under primitive earth conditions. (Author abstract)##

00618

E. A. Schuck, J. N. Pitts, Jr., J.K.S. Wan

RELATIONSHIPS BETWEEN CERTAIN METEOROLOGICAL FACTORS AND PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution Vol. 10(10):689-711, Oct. 1966. (Presented at Photochemistry Symposium, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Apr. 20-22, 1964.)

By a method of averaging, involving a large amount of atmospheric monitoring data, it has been shown that

interesting and perhaps valid information on the formation and intensities of smog symptoms can be obtained. For example, it has been shown that the concentration of maximum daily oxidant is a function of day of the week and that this function might be related to automotive traffic patterns. Thus for certain time periods maximum daily oxidant was at a minimum on weekends at stations in the northern protion of the Los Angeles Basin (Burbank, Pasadena, Azusa). During this same time period the maximum daily oxidant was found to be at a maximum on weekends near certain cities in the southern portion of the Basin (Inglewood, Long Beach). These two distinctly different weekend patterns correspond in part to the recreational activities of the populace, and in addition, indicate that mixing is less than complete in the Los Angeles Basin. In spite of this lack of complete mixing the maximum daily oxidant at stations within a 600 to 800 square mile area are directly proportional to each other in a predictable fashion. The weekend daily temperatures are also affected presumably by the same factors which influence the weekend oxidant intensity. Changes in inversion height and wind speed appear to account for twofold changes in maximum daily oxidant values. Maximum daily oxidant concentration was also found to be directly related to the square root of light intensity with little if any dependence on temperature. This study also indicates that pollution levels are proportional to each other over large areas of the Basin. The analysis of atmospheric data indicates that variable hydrocarbon to oxides of nitrogen ratios do exist in the atmosphere and that there exists a dependence of atmospheric smog symptom intensity upon this ratio.##

00629

F. Ausloos and S. G. Lias

H2S AS A FREE-RADICAL INTERCEPTOR IN THE GAS-PHASE RADIOLYSIS AND PHOTOLYSIS OF PROPANE. J. Chem. Phys. Vol. 44(2):521-529, Jan. 1966.

The gas-phase photolysis (1216 Angstrom units) and the gamma-ray radiolysis of C3D8 has been investigated in the presence of varying concentrations of H2S. When 10% or more H2S is added to C3D8, the majority of the D, CD3, C2D3, and C3D5 radicals abstract an H atom from H2S to form HD, CD3H, C2D3H, and C3D5H, respectively. The fully deuterated molecules formed in these mixtures result from the unimolecular elimination of a stable molecule from C3D8 or C3D8(plus) and from fast bimolecular processes such as ion-molecule reactions. The mechanisms of the radiolysis and the photolysis proposed in earlier studies have been re-examined in the light of the information derived from the C3D8 - H2S experiments and of some additional photolysis experiments on CD3CH2CD3 - NO mixtures. The modes of decomposition of the neutral excited propane molecule are indicated. The internally excited C3D4, C3D5, C3D6, and C3D7 species formed in these primary processes decompose to form D, CD3, C2D2, C2D3, and C3D4 unless they are collisionally stabilized. In the radiolysis of C3D8 - H2S mixtures, yields of the free radicals can be adequately accounted for by taking into account the modes of fragmentation of the parent ion and of the excited propane. The C3D5 (plus) ions are shown to react with H2S in part by the

deuteron-transfer reaction. The effect of pressure and the effectiveness of HI as a free-radical interceptor in the radiolysis have been examined. (Author abstract)##

00757

A.P. Altshuller J.J. Bufalini

PHOTOCHEMICAL ASPECTS OF AIR POLLUTION: A REVIEW. Photochem. Photobiol., Vol. 4, 97-146, 1965.

Materials that are emitted in the atmosphere are subjected to a number of interesting and unusual reactions. These reactions lead to many products whose deleterious effects have now been recognized as one of the most pressing problems in urban areas throughout the world. These effects can be observed in reduced visibility, eye irritation, plant damage, cracking of rubber, and corrosion of metals. This paper is concerned with the present state of the problems in air pollution, with emphasis on recent literature. The chemical aspects are covered in some detail through 1963. The biological effects are surveyed more briefly, with literature reviewed up to the fall of 1963.##

00771

J.J. Bufalini A.P. Altshuller

KINETICS OF VAPOR PHASE HYDROCARBON - OZONE REACTIONS. Can. J. Chem. 43,2243-2250, 1965.

The reaction of nine olefinic and aromatic hydrocarbons with ozone in the vapor phase have been investigated in static and dynamic systems. Some of the rate constants for the olefin-ozone reactions are in good agreement with previously published data, whereas others are larger than values previously reported. Rate constants for trans-2-butene-, isobutene-, and ethylene-ozone reactions were measured between 20 and 100 degrees C. The activation energies for the reaction of ozone with trans-2-butene, isobutene, and ethylene are 0.2 plus or minus 0.1, 2.0 plus or minus 0.4, and 4.2 plus or minus 0.4 kcal/mole. In general, the reactions of hydrocarbons with ozone are nonstoichiometric. However, these reactions do appear to be second order. The rates of reaction between alkylbenzenes and ozone are too low to be of importance in air pollution studies. (Author abstract)##

00781

D.A. Lynn, B.J. Steigerwald, J.H. Ludwig

THE NOVEMBER-DECEMBER 1962 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Cincinnati, Ohio, Bndiv. of Air Pollution. (999-AP-78) 1966. 20pp.

This report documents the subject "episode" with respect to meteorology, air quality, and public reaction. Particulate and gaseous air quality data are reported and discussed. Meteorology and public reaction are discussed with reference to

the Public Health Service program of Air Pollution Potential Forecasts. Epidemiological aspects are not considered. (Author abstract)**

00789

J.N. Pitts, Jr.; L.D. Hess; E. J. Baus; E.A. Schuck; J. K. S. Wan

THE TRANSFER AND CONVERSION OF ELECTRONIC ENERGY IN SOME "MODEL" PHOTOCHEMICAL SYSTEMS. Photochem. Photobiol., Vol. 4:105-21, 1965. (Presented at the Rapporteur Session, the Fourth International Congress of Photobiology, Oxford, England, July 26-30, 1964.)

Recent studies of the effects of molecular structure and reaction environment on the mechanism of primary photochemical processes involving transfer and conversion of electronic energy in relatively 'simple' organic molecules are presented and discussed. A quantitative i.r. spectroscopic method for studying intramolecular and intermolecular photoprocesses of u.v. irradiated substrates dispersed in solid alkali halide matrices at room temperature is described. Current data for the substrates ortho-nitrobenzaldehyde, anthracene and benzophenone-benzhydrol are presented. A series of 'model' ketones containing cyclopropyl groups have been synthesized and while their absorption spectra are similar, the efficiency of vapor-phase photodissociation into radicals is shown to be strongly dependent on molecular structure. Butyrophenone and a series of ring substituted derivatives have been photolyzed in the liquid phase using the quantum yield of the photo-elimination of ethylene (Type II split) as a "probe" to determine the effect of substituents on the internal H atom abstracting power of the excited carbonyl chromophore. Phi sub C2H4 is very sensitive to ring substitution, dropping from 0.29 in butyrophenone to 0.20, 0.050 and 0.00 in the p-CH3, p-OCH3 and p-NH2 derivatives respectively, and to 0.00 in both ortho and para hydroxy derivatives. This effect is correlated with their absorption spectra in terms of the lowest states of these alkyl aryl ketones. While several 'classic' photochemical reactions, unimolecular and bimolecular, proceed efficiently in solid KBr matrices giving the same product as in liquid systems, the 'model' cyclopropyl compounds and the alkyl aryl ketones did not undergo their usual intramolecular processes. Implications of this molecular environment effect are pointed out. (Author abstract)**

00818

C.S. Benson

ICE FOG; LOW TEMPERATURE AIR POLLUTION (DEFINED WITH FAIRBANKS, ALASKA AS TYPE LOCALITY). Alaska Univ., College, Geophysical Inst., Nov. 1965. 196 pp.
CFSTI, DDC: AD 631553

Ice fog crystals are an order of magnitude smaller than diamond dust, or cirrus cloud crystals, which in turn are an order of magnitude smaller than common snow crystals (0.01, 0.1 and 1 to 5 mm respectively). The differences in size are shown to result from differences in cooling rates over

5 orders of magnitude. Most of the ice fog crystals have settling rates which are slower than the upward velocity of air over the city center. The upward air movement is caused by convection cells driven by the 6 C "heat island" over Fairbanks. This causes a reduced precipitation rate which permits the density of ice fog in the city center to be three times greater than that in the outlying areas. The inversions which occur during cold spells over Fairbanks begin at ground level and are among the strongest and most persistent in the world. They are three times stronger than those in the inversion layer over Los Angeles. Thus, the low-lying air over Fairbanks stagnates and becomes effectively decoupled from the atmosphere above, permitting high concentrations of all pollutants. The combustion of fuel oil, gasoline, and coal provides daily inputs of: 4.1 x 10 to the sixth power kg CO2; 8.6 x 10 to the third power kg SO2; and 60, 46 and 20 kg of Pb, Br and Cl respectively, into a lens-like layer of air resting on the surface with a total volume less than 1 x 10 to the ninth power cubic meter. The air pollution over Fairbanks during cold spells couldn't be worse, because the mechanisms for cleaning the air are virtually eliminated while all activities which pollute the air are increased. (Author abstract modified)##

00929

CONTINUOUS AIR MONITORING PROGRAM IN CINCINNATI, 1962-1963. Public Health Service, Cincinnati, Ohio. Div. of Air Pollution. (999-AP-21). Jan. 1965. 191 pp.

This report presents results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Cincinnati, Ohio, during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monoxide are analyzed and discussed. The data are tabulated as hourly, daily, and monthly mean concentration. Background information about Cincinnati and descriptions of the instrumentation are included. (Author abstract)##

00935

J. N. Pitts, Jr., R. Cimerman, and J. R. Vernon

LIQUID PHASE PHOTOLYSIS OF Y-BUTYROLACTONE. Tetrahedron Letters, No. 35:1209-1211, 1965.

In view of the variety of interesting photochemical reactions reported for saturated cyclic ketones and acyclic esters and the lack of similar studies on lactone, the authors have photolyzed representatives of the latter class of compounds and report here preliminary results with gamma-butyrolactone. Vacuum degassed butyrolactone was irradiated in a quartz cell (9 ml) with a Hanovia medium pressure UV lamp, and gaseous products were separated by conventional high-vacuum techniques. The major products, carbon monoxide, carbon dioxide, cyclopropane and ethylene (relative amounts 3.5 : 0.9 : 0.9 : 1.0), were identified by comparison of gas chromatographic retention times (hexadecane, 25 degrees) and mass spectra with those of authentic materials. In addition, traces of ethane, propane and propylene were characterized by gas chromatographic comparisons.##

00952

A. C. Hakkeness and F. F. Murray

GAS PHASE OXIDATION OF METHYL SULFIDE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-58.)

Methyl sulfide and oxygen react explosively at temperatures as low as 210 degrees. At 195 degrees, the nonexplosive reaction exhibits an initiation stage and a main stage. The rate of the main stage as determined from pressure-time curves is linearly dependent on initial oxygen pressure, but substantially independent of initial methyl sulfide pressure. The activation energy of the main stage is 42 kcal/mole. The extent of the initiation stage is reduced by increasing oxygen pressure. The main oxidation products are sulfur dioxide and carbon monoxide. Even with an excess of oxygen not all methyl sulfide reacts. (Author abstract)##

01021

E. J. Gordon

PHOTOCHEMICAL MEASUREMENTS OF ULTRAVIOLET SUNLIGHT. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-38.)

Measurements of solar ultraviolet radiation intensity were made, using two photochemical reactions. These were the gas-phase bag photolysis of NO2 in nitrogen and the photoisomerization of o-nitrobenzaldehyde in liquid solution. Results of the two methods were converted, as nearly as possible, to absolute light intensities. The two sets were compared and, as applied, it appears that the solution method is simpler and gives more consistent results. It should be noted, however, that atmospheric NO2 will affect the two methods to different degrees. A continuous recording actinometer based on the solution method was developed and gave satisfactory initial trial runs.##

01194

E. Grovenstein, Jr.

PHOTOCHEMICALLY INDUCED REACTIONS OF ACETYLENES WITH AROMATIC COMPOUNDS (FINAL REPT.) Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. Aug. 1965. 30 pp.
DDC: AD 470946

Irradiation with ultraviolet light of a mixture of benzene and acetylene under a variety of experimental conditions gave, at best, only a trace of cyclooctatetraene. No photo-adduct could be found of acetylene with dimethyl phthalate, naphthalene, or anthracene. Vinylene carbonate underwent no detectable photochemical reaction with benzene. Chlorovinylene carbonate, however, upon irradiation in benzene or cyclohexane solution undergoes reduction to give vinylene carbonate in good yield. Benzene with a solution

of the monopotassium salt of acetylenedicarboxylic acid gives, upon ultraviolet irradiation, a different product from that obtained with dimethyl acetylenedicarboxylate. Naphthalene, upon irradiation with a solution of dimethyl acetylenedicarboxylate, gives a complex mixture of products which appear to be the result of an initial 1,2-addition of the acetylenic ester to the various aromatic multiple bonds of naphthalene. From the reaction mixture a crystalline derivative has been isolated which seems to have been derived from addition of dimethyl acetylenedicarboxylate to the 1,2-position of naphthalene. Furthermore, vapor phase chromatography (v.p.c.) provisionally indicates the presence of dimethyl phthalate, dimethyl naphthalene-2,3-dicarboxylate, dimethyl cyclooctatetraene-1,2-dicarboxylate, as well as naphthalene and dimethyl acetylenedicarboxylate in the purified reaction product. Since it was demonstrated that all of the naphthalene should have been removed by the purification process, the v.p.c. results indicate that the naphthalene adducts are undergoing pyrolysis under the conditions of the v.p.c. analysis. Reaction schemes are proposed to account for the observed products. Preliminary experiments show that phenanthrene reacts readily with dimethyl acetylenedicarboxylate upon irradiation with ultraviolet light. In experiments in which benzophenone was added as a photo-sensitizer, benzophenone was found to undergo addition of alcohol, especially methanol, to give considerable amounts of mixed pinacol. (Author abstract)##

01264

J. J. Bufalini and J. E. Purcell

NITROGEN: FORMATION BY PHOTOOXIDATION OF ETHYLENE IN THE PRESENCE OF ITS OXIDES . Science 150, (3700) 1161-2, Nov. 26, 1965.

The apparent lack of nitrogen balance for the photooxidation systems containing olefin and nitrogen oxides can be explained by evidence for the production of molecular nitrogen; molecular nitrogen was identified by gas chromatography and mass spectrometry. (Author abstract)##

01269

F. C. Alley, G. B. Martin, and W. H. Ponder

APPARENT RATE CONSTANTS AND ACTIVATION ENERGIES FOR THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS . J. Air Pollution Control Assoc. 15, (8) 348-50, Aug. 1965.

The photochemical reaction of various olefins and nitrogen dioxide was studied under conditions of controlled temperature, pressure, and humidity in a 200 liter stirred glass reactor. The hydrocarbon concentration in the reactor during four and five hour irradiation periods was monitored with a flame ionization chromatograph. Reaction rate constants, based on three consecutive first order reactions, were calculated for reactor temperatures of 20, 25, 30, and 35 degrees centigrade. Activation energies for the three consecutive reactions were calculated from the Arrhenius equation. Branched and straight chain olefins were studied at initial concentrations of 5.0 to 10.0 parts per million. (Author abstract)##

01481

Nader, J. S. (ed.)

PILOT STUDY OF ULTRAVIOLET RADIATION IN LOS ANGELES, OCTOBER 1965. (A REPORT ON CONCURRENT MEASUREMENTS MADE BY COOPERATING ORGANIZATIONS BY VARIOUS METHODS.) Public Health Service, Cincinnati, Ohio. National Center for Air Pollution Control, PHS-Pub-999-AP-38, 91p.; (Presented at the Fourth International Biometeorological Congress, Rutgers Univ., New Brunswick, N.J., Aug. 28 - Sept. 2, 1966.)

Measurements of 300-380-ns UV radiation in Los Angeles were conducted under varying conditions of smog environment, below and above the urban smog layer, and at various elevations through the smog atmosphere in October 1965. The UV energy incident on a horizontal plane surface detector near ground level at solar noon on a clear day (no smog) was 31 w/s square meter or 17% of the maximum possible for that date based on the value of 85 w/sq m of UV radiation entering the earth's atmosphere. Attenuation of UV radiation varied with smog intensity. Transmission through the atmosphere from 5700 feet (Mt. Wilson) to 150 feet (laboratory rooftop) above mean level, average through the day, was 87% for a clear day and 65% for a moderate-to-heavy-smog day. Outgoing radiation was significantly increased by the smog environment. In heavy smog, values were higher by a factor of about 2 than those obtained in a no-smog environment. Outgoing radiation also tended to increase exponentially with elevation. UV scatter or transmission measurements appear to offer potential as a sensitive method of monitoring environmental smog levels as an alternative to visibility which is subjective and nonquantitative. The high scattering capability of a smog atmosphere points to the need of measurements of UV radiation in all directions, particularly as this applies to photochemical reactions in the atmosphere, and a correlation of such measurements with measurements of vertical components. (Author's summary)##

01509

W. J. Haagen and J. E. Dickinson

CONTROL OF PHOTOCHEMICAL SMOG BY ALTERATION OF INITIAL REACTANT RATIOS. J. Air Pollution Assoc., 16(6):317-323, June 1966.

A study of the variation in eye irritation with irradiation time demonstrates that the time at which eye irritation measurements are taken is important in understanding the entire photochemical mechanism underlying the smog problem in the summer in Los Angeles. The data analyzed were obtained from 5 experimental studies conducted under a variety of conditions. Analysis of the data from chamber irradiation experiments indicate that eye irritation is noted at the same time as the max. concentration of nitrogen dioxide. The chamber data have shown that the initial concentrations of the 2 principal reactant contaminants, hydrocarbons, oxides of nitrogen, and the relationship between them, must be considered in studying the production of eye irritation from photochemical smog. To determine how the initial reactant concentrations affect the degree of eye irritation which can be produced, the available data from several experimental studies were analyzed.##

01587

G.J. Doyle

MODEL AEROSOLS FOR ATMOSPHERIC SMOG. Stanford Research Inst., South Pasadena, Calif., Southern California. 1961. 19pp.

One model reaction for formation of aerosol in the atmosphere requires the presence of sulfur dioxide at fractions of a part per million in photooxidizing mixtures of olefin and nitrogen oxide at part per million concentrations. An experimental study of this type of reaction and the results to date are described, with particular emphasis on 2-methyl-2-butene as the olefin.##

01602

E.A. Schuck

THE NATURE OF EYE IRRITANTS IN SMOG. Stanford Research Inst., South Pasadena, South Pasadena, Southern California Labs. 1961. 8 pp.

Three ppm of individual hydrocarbons were mixed in pure air along with 1 ppm of nitric oxide or nitrogen dioxide. During the subsequent two hour irradiation with near-ultraviolet light the mixture was monitored with a long-path infrared spectrophotometer. The major products formed by photooxidizing many individual hydrocarbons were readily identified and their concentrations measured. In general, it was found that most olefins react rapidly and generate irritation while saturated hydrocarbons are relatively unreactive and do not result in irritating mixtures. In the absence of specific knowledge of the types and concentrations of the components of smog-producing atmospheres, control of olefins rather than oxides of nitrogen appears to be the more practical approach to control of eye irritation. The effect of control measures on eye irritation will be a function of several factors. Some of these factors are: the olefin-to-oxides of nitrogen concentration ratio; the type of olefin or olefin mixture involved; and the length of irradiation time and intensity of sunlight. To the extent that these auto exhaust mixtures are typical, it is concluded that ethylene and propylene are the most important precursors of eye irritation in such mixtures.##

01649

U. H. Nicol and J. G. Calvert

RELATIONS BETWEEN PHOTODECOMPOSITION MODES AND MOLECULAR STRUCTURE IN THE SERIES OF CARBONYL COMPOUNDS, R- C_3H_7COR. Preprint. (Presented in part at the Gordon Conference on Organic Photochemistry, Tilton, N.H., July 1965.)

The vapor phase photolysis of a series of carbonyl compounds of general structure n-C_3H_7COR was studied at 3130 A as a function of temperature and pressure. The R group was varied in the series, H, CH_3, C_2H_5, n-C_3H_7, iso-C_3H_7, n-C_4H_9,

iso-C4H9, sec-C4H9, tert-C4H9, in order to evaluate the effect of structure upon the individual primary photodissociative processes and the relationship between these processes. Quantum yields of carbon monoxide and ethylene products were used as measures of the type I (n-C3H7 COR + h nu yields n-C3H7CO + R and n-C3H7 + COR) and type II (n-C3H7COR + h nu yields C2H4 + CH2=C(OH)R primary photodissociative modes in the ketones. A number of correlations were noted between the structural features and the efficiency of the Type II rearrangement. One striking effect was the relation between phi II and the extent of alkyl substitution on the alpha-carbon atom of the R group. An empirical rule was formulated which relates molecular structure and the phi II values for the n-propyl ketones. (Author abstract)##

01650

B. E. Saltzman , A. F. Coleman, and C. A. Clemons

HALOGENATED COMPOUNDS AS GASEOUS METEOROLOGICAL TRACERS: STABILITY AND ULTRASENSITIVE ANALYSIS BY GAS CHROMATOGRAPHY. Anal. Chem. 38, 753-8, May 1966.

Tracer compounds added to moving air masses are useful for demonstrating the transfer of pollutants from one local area or city to another. A study of gaseous compounds resulted in the selection of three suitable materials: sulfur hexafluoride, bromotrifluoromethane, and octafluorocyclobutane. These materials are non-toxic, are rare in the atmosphere, and can be readily dispersed from weighed tanks containing them in liquid form under pressure. An appropriate mixture can be employed if necessary to reduce possible errors caused by interfering emissions, and the components in air can be determined with high sensitivity in a single 10-minute run. An ultrasensitive gas chromatographic procedure with an electron-capture detector was developed which utilized carefully purified carrier gas and optimized columns, detectors, and operating parameters. Sensitivity of 10 to the minus five power ppm was achieved for sulfur hexafluoride without concentration of the sample. Convenient procedures for sampling and calibration were established. Reactivities of these materials with ordinary atmospheric pollutants such as automobile exhaust, hydrogen sulfide, nitrogen dioxide, ozone, and sulfur dioxide were studied at various humidities, both with and without irradiation equivalent to sunlight. Good stability was indicated. Losses by washout due to rainfall appeared to be negligible. These techniques should be very useful both for tracing local emissions and for long-range meteorological studies of movement of air masses. (Author abstract)##

01761

T. Kato

GAS CHROMATOGRAPHY OF SMALL AMOUNTS OF HYDROCARBONS IN THE ATMOSPHERE. Nenryo Ryokaishi (J. Fuel Soc. Japan, Tokyo) 45, (470) 406-13, June 1966.

Gas chromatographic analysis in practical air pollution research was studied. Low temperature trapping and adsorption were most important. In each method, sampling, concentration, G.C. analysis and examples of the results were described. In the

former, sample air was introduced into a vacuum glass bottle, which was evacuated through a concentration tube filled with adsorbent and cooled with liquid oxygen to -183 C, then trapped pollutants were transferred to G.C. sampling tube and analysed. For total analysis of air sample, sample air was introduced into the adsorption tube filled with charcoal, then adsorbed pollutants were desorbed by heating to 350 C, transferred to a G.C. sampling tube and chromatographed. (Author summary)##

01825

S. L. Kopczynski

PHOTO-OXIDATION OF ALKYLBENZENE-NITROGEN DIOXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 8, 107-20, 1964.

Measurements of the relative reaction rates of various alkylbenzenes in photo-oxidative reactions with NO_2 in the air are reported. The reaction rates are compared with the relative basicities of the compounds. A partial analysis of the gas phase and condensed phase products is also reported. It appears that as much as 50 per cent of the reacted carbon atoms may be contained in the condensed phase. The several irradiation and analytical techniques employed are compared. The photo-oxidation reactions of olefins and alkylbenzenes are compared. Free radical chains appear to play a more important role in the photo-oxidation reaction rates of certain alkylbenzenes than in the reaction rates of olefins. Hyperconjugative interaction of the methyl groups with the aromatic ring is proposed as a possible explanation of the order of reactivity of various isomers of the methylsubstituted benzenes. (Author abstract)##

01826

A. P. Altshuller, G. C. Ortman, R. F. Saltzman, and R. R. Neligan

CONTINUOUS MONITORING OF METHANE AND OTHER HYDROCARBONS IN URBAN. J. Air Pollution Control Assoc. 16, (2) 87-91, Feb. 1966.

Continuous measurements of total hydrocarbons (and other organic substances) and of methane were made in Cincinnati and Los Angeles for three-month periods. Some of the measurements were made during episodes of photochemical air pollution. Two instruments, one for measurement of total hydrocarbons and the other for methane, were operated in parallel. Both incorporated flame ionization detectors having greater sensitivity than commercial flame ionization instruments. The flame ionization analysis for methane was made specific by use of an adsorbent carbon column preceding the analyser to retain all organic substances except methane. Subtracting the methane concentration values from those for total hydrocarbons gave nonmethane hydrocarbon concentrations. The data showed diurnal patterns of concentrations of methane and nonmethane hydrocarbons in the atmosphere. Average hourly values for methane were strikingly similar in Los Angeles and in Cincinnati (2.6 and 2.4 ppm, respectively); those for nonmethane hydrocarbons were four

times as high in Los Angeles (1.0 and 0.8 ppm, respectively). A bimodal frequency distribution pattern of the concentrations suggested that atmospheric ventilation was either good or poor, with less than a random amount of time in intermediate stages. The width of the methane frequency distribution peak was about half the width of that for nonmethane hydrocarbons, indicating a different and more constant source for the former. (Author abstract)##

01964

A. P. Altshuller and I. R. Cohen

STRUCTURAL EFFECTS ON THE RATE OF NITROGEN DIOXIDE FORMATION IN THE PHOTO-OXIDATION OF ORGANIC COMPOUND-NITRIC OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution, 7, 787-97, 1963.

The rapid conversion of nitric oxide to nitrogen dioxide occurs in the presence of certain organic species and of ultraviolet radiation below 4000 A. The reaction is an important and critical step in the over-all reactions of organic compound-nitric oxide photochemical systems. These systems in turn are an important part of the reaction complex associated with the photochemically initiated type of air pollution. The eye irritation and plant damage effects found in photo-chemical "smog" have been simulated by the irradiation of certain hydrocarbon-nitrogen oxide systems (Leighton, 1961). Until recently the available experimental data on the photochemically initiated conversion of nitric oxide to nitrogen dioxide has been restricted almost entirely to work on olefinic hydrocarbons including isobutene, trans-2-butene, and 1,3-butadiene (Leighton, 1961; Tuesday, 1961). Recently, preliminary work has been reported on other organic species including the aromatic hydrocarbons (Altshuller et al. 1962a). It was shown that a number of dimethyl and trimethylbenzenes participate in this reaction about as effectively as do the 1-alkenes and appreciably more rapidly than toluene. In the present work this study is extended to additional aromatic hydrocarbons, aldehydes, ketones, paraffinic hydrocarbons, and alcohols. Analyses for oxidant concentrations have been made on some of the systems studied. Some data have been obtained on the formation of aliphatic aldehydes in the reactions of aromatic hydrocarbon-nitric oxide systems. (Author abstract)##

02459

S.L. Kopczynski A.P. Altshuller

PHOTOCHEMICAL REACTIONS OF HYDROCARBONS WITH SULFUR DIOXIDE. Intern. J. Air Water Pollution, 6, 131-135, 1962

Gas mixtures of SO2 and hydrocarbons n-butane, isobutane, neopentane, 3-methyl-1-butene irradiated by either a mercury arc or sunlamp, produced appreciable quantities of condensate on the walls of the experimental flasks. A carbonyl band was present at 5.7 microns. In several experiments with isobutane as the hydrocarbon, a strong band at 5.7 microns was observed along with other IR bands assigned to the acetone molecule. A set of 3 strong bands in the 9.5 to 10 micron region characteristic of methanol was observed also. At 1 am partial pressure of SO2 and n-butane or isobutane, a slight flim

of condensate could be observed when the Hg arc was used, but not when the sunlamp provided the UV radiation. Acetone and methanol were indicated by spectral data on the more dilute mixtures. At concentrations of 0.05 to 0.1 mm, no film could be detected from SO_2 and i-butane or 1-pentene mixtures irradiated by sunlamp; with the Hg lamp only weak IR bands could be obtained after 20 hours. Evidence indicates that photooxidation of SO_2 in the presence of saturated hydrocarbon at concentrations found in the atmosphere does not significantly contribute to formation of aerosols in air pollution situations in comparison with aerosol results from other reactions involving SO_2 in combination with NO and olefins.##

02152

J.J. Bufalini A.P. Altshuller

SYNERGISTIC EFFECTS IN THE PHOTOOXIDATION OF MIXED HYDROCARBONS. Environ. Sci. Technol. 1, (2) 133-8, Feb. 1967.

Since there is considerable disagreement in the published values for rate constants for olefin-atomic oxygen and olefin-ozone reactions, the reality of the so-called excess rate has been questioned. If the excess rate is not real, then the rate of oxidation of a given olefin should depend only on light intensity and NO_2 concentration. If a second olefin of different reactivity is added to a given olefin, then no effect other than the influence of different O-atom and ozone concentrations should be observed on the given olefin and the hypothesis that the principal mode of disappearance of olefins is due to O-atom and ozone reactions is correct. As a test of this hypothesis, 1-butene was irradiated at three light intensities with NO_2, both alone and in the presence of trans-2-butene and 1,3,5-trimethylbenzene separately. Synergistic effects were observed that could not be explained by O-atom and ozone reactions alone. (Author abstract)##

02476

E. R. Stephens.

REACTIONS OF OXYGEN ATOMS AND OZONE IN AIR POLLUTION. Intern. J. Air Water Pollution 10, 649-61, Oct. 1966 (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, April 1965.)

The reactions of free oxygen atoms and ozone as they apply to air pollution and the factors which govern the oxygen atom and ozone concentrations are reviewed. The role played by reactions of oxygen atoms with oxides of nitrogen is discussed as it affects the determination of light intensity by photolysis of nitrogen dioxide. The realtionship of these inorganic reactions to the attack on hydrocarbon molecules is discussed along with the various attempts which have been made to account for the rate of disappearance of hydrocarbon in terms of its reactions with oxygen atoms and ozone. Since most of these attempts have indicated that these two reactions fall short of accounting for the observed rate of reaction, it has been suggested that free radical attack may play a

role. Some difficulties with this concept are pointed out. Experiments on the reaction of olefins with ozone have produced discordant results and are discussed. (Author abstract modified)#

02777

A. P. Altshuller, I. R. Cohen, and T. C. Purcell

PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC ALDEHYDES. Science 156 (3777), 937-9, (May 19, 1967). 1966.

A new group of gas-phase reactions has been shown to contribute to the photooxidation of hydrocarbons. The photooxidation of aliphatic aldehydes in the part-per-million range at wavelengths below 3400 A produces intermediates that react with olefinic and aromatic hydrocarbons. The reactions have been investigated with laboratory ultraviolet radiation sources and solar radiation. Although the reaction rates are slower than those associated with the corresponding nitrogen oxide induced photooxidations, the rates are significant in terms of the time scale of interest in urban atmospheric reactions. These results may cause modifications of current considerations of whether control of nitrogen oxides will effectively reduce photochemical air pollution. (Author abstract)##

03068

Cadle, R. D. and J. W. Powers

SOME ASPECTS OF ATMOSPHERIC CHEMICAL REACTIONS OF ATOMIC OXYGEN. Tellus (Uppsala), 18(2):176-186, 1966. 44 refs.

Some features of atmospheric atomic oxygen chemistry that have received little attention, that need to be re-evaluated in the light of recent data, that have been studied in the author's laboratory, or that encompass some combination of these three are discussed. Newly-calculated values for the concentrations of excited atomic oxygen below 100 km are so low that it is unlikely that its reactions contribute appreciably to the concentration of any atmospheric component in that region with the possible exception of excited molecular oxygen. Reactions of ground state atomic oxygen may constitute a sink for methane and a source of sulfate in this atmospheric region. Many chemionization reactions probably occur in the atmosphere, and three possible types are considered in detail. (Author abstract)##

03161

R. Heiberger, "Chairman."

THE DISPERSION AND DEPOSITION OF AIR POLLUTANTS OVER CITIES. (Air Over Cities Symp., Cincinnati, Ohio, 1961.) pp. 155-71. HEW A 62-5

In setting limits for the control of pollution sources in industrial and urban complexes, limits must not be established solely on the basis of individual stacks and plants; the basic concept must be the area-source strength, in terms of total emissions per square mile, since the emissions from separate

stacks and plants are additive as the air moves across them toward residential and commercial communities. The dispersion of pollutants from vehicle exhaust along congested streets and roads deserves attention. Such questions as the influence of heat from motor and the motion of the vehicles need examination. Studies of dispersion have generally assumed flat uniform terrain and wind conditions in which the direction is steady and the average speed is high compared to turbulent fluctuations. Studies must be performed on the dispersion of pollutants over an irregular complex of buildings and under the influence of wind conditions in which the average speed is low and the magnitude of windspeeds in fluctuations is as great or greater. (Author summary)##

03673

Rainbridge, A. E. and Leroy E. Heidt

MEASUREMENTS OF METHANE IN THE TROPOSPHERE AND LOWER STRATOSPHERE. Tellus (Uppsala), 19(2):221-226, 1966. 18 refs.

Two profiles of air samples have been collected over southern U.S.A. (30 deg N lat.) between ground level and 23 km and analyzed for methane. The results show, with increasing altitude, a rising ratio nearly constant to the tropopause and decreasing rapidly in the lower stratosphere. The results suggest that the troposphere is the major region of destruction of methane. (Authors' summary)##

03858

A. P. Altshuller, S. L. Kopczynski, W. A. Lonneman, F. D. Becker, F. Sister

CHEMICAL ASPECTS OF THE PHOTOOXIDATION OF THE PROPYLENE--NITROGEN OXIDE SYSTEM. Environ. Sci. Technol., 1(11):899-914, Nov. 1967. 29 refs.

Although it is not possible to fully represent all of the diverse effects associated with photochemical air pollution by studies of a single hydrocarbon, propylene was chosen as a representative reactive hydrocarbon. The propylene-nitrogen oxide or propylene nitrogen oxide-sulfur dioxide system when irradiated reacts readily to produce oxidant, formaldehyde, acetaldehyde, carbon monoxide, peroxyacetyl nitrate (PAN), and methyl nitrate, along with light scattering, and causes ozone and PAN-type plant damage and eye irritation. Thus, all of the major "smog" manifestations are reproducible, but not necessarily at the intensities experienced in the ambient atmosphere. The chemical and physical measurements of the photooxidation of propylene-nitrogen oxide or of propylene nitrogen oxide-sulfur dioxide over a range of reactant concentrations, at several light intensity levels, and under static or dynamic flow conditions are reported. Biological indicator measurements will be reported in another paper. (Authors' abstract, modified)##

03875

D. E. Loudon

REQUIREMENTS FOR SAFE DISCHARGE OF HYDROCARBONS TO ATMOSPHERE. Proc. Am. Petrol. Inst., Sect. III, 43, 318-33, 1963. (Presented at the 28th Midyear Meeting, American Petroleum Inst. Division of Refining, Philadelphia, Pa., May 15, 1963.)

Current knowledge, opinion, and service experience relative to the disposal of released hydrocarbons, is assembled with emphasis on atmospheric discharge. Potential hazards to personnel and equipment associated with the release of hydrocarbon vapor to the atmosphere include: 1, ignition of outflow, either immediate or delayed; 2, explosive release of energy from delayed ignition; 3, flame radiation; 4, condensation of vapor; 5, noise; and, 6, pollution. The present state of knowledge relative to these hazards is discussed. This leads directly to an appreciation of aspects where general knowledge, experience data, or fundamentals are inadequate or totally lacking. The individual subjects requiring attention are summarized. (Author abstract modified)##

04245

M. A. Kryiova

COLORIMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF PHENYLURETHYLANE IN FACTORY AIR. Hyg. Sanit. 31, (8) 250-5, Aug. 1966. Russ. (Tr.)
CFSTI: TT-51160/7-9

Phenylurethylane solution boiled with an alkali hydrolyses to aniline and sodium acetate. Thus, the determination of phenylurethylane can be based on the determination of aniline. In the present work the diazotising reaction of aniline was used and followed by the reaction of the diazo compound with alpha-naphthylethylenediamine. Colorimetric analysis was recommended for separate investigations of the two substances, phenylurethylane and aniline, when present together. Spectrophotometric determination of phenylurethylane in samples was also recommended. This method is non-specific as aniline interferes by yielding an absorption maximum in the same range.##

04246

F. D. Krivoruchko

DETERMINATION OF AERIAL CONCENTRATION OF DECOMPOSITION AND OXIDATION PRODUCTS OF CERTAIN ORGANOALUMINUM COMPOUNDS (TEA, DEAC, TIBA, AND DIBAC). (Opredelenie produktov razlozheniya i okisleniya v vozdukhe nekotorykh alyuminiiorganicheskikh soedinenii (TEA, DEAKh, TIBA i DIBAKh.) Hyg. Sanit. 31, (8) 256-9, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

In connection with studies of working conditions in the manufacture of triethylaluminum (TEA), diethylaluminum chloride (DEAC), triisobutylaluminum (TIBA) and diisobutylaluminum chloride (DIBAC) it was necessary to determine health hazards in

the factory air. Determination in air of substances formed by the decomposition and oxidation of TEA, DEAC, TIBA and DIBAC formed the purpose of the present work. Organoaluminum compounds in sealed glass ampules were used. Investigations were performed in 100 l chambers with a fan for uniform distribution of the decomposition products from organoaluminum compounds. The ampules with samples were broken with a special rod. The breaking of an ampule was followed by the formation of a white aerosol in the chamber (obviously, aluminum oxide) which persisted for 1.5-2.5 hr and then was slowly deposited on the chamber walls. Air samples were taken from the chamber at different time intervals (from 0 min to 1.5 hr). Aluminum oxide aerosols were sampled on an ashless filter paper of "Blue Band" grade in a Plexiglas cartridge. Samples for other toxic substances were taken by means of absorbers, placing filter paper in front of the absorber in order to exclude aluminum oxide. Investigations showed that the processes liberated aluminum oxide aerosol, isobutylene, lower and higher alcohols, aldehydes, carbon monoxide and hydrogen. Moreover, the decomposition and oxidation of DIBAC yielded hydrochloric acid aerosols while the decomposition and oxidation of DEAC yielded ethyl chloride.##

04931

Niemeyer, L. E. and R. A. McCormick

SOME RESULTS OF MULTIPLE-TRACER DIFFUSION EXPERIMENTS AT CINCINNATI. J. Air Pollution Control Assoc., 18(6):401-405, June 1968. 7 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967. Paper 67-66.)

A number of diffusion experiments during near-neutral stability conditions are described which utilize the simultaneous dissemination of up to three gaseous and one particulate tracer material. The gases are sulfur hexafluoride (SF_6), octafluorocyclobutane (C_4F_8), and bromotrifluoromethane ($CBrF_3$). The fourth tracer was a particulate, zinc-cadmium sulfide ($ZnCdS$), referred to as FP. The magnitude and sources of "non-meteorological" errors are analysed with respect to a single experiment using but one tracer. The relation of observed ground-level concentrations out to distances of the order 125 km from the source to those estimated by the extrapolation of shorter-range experimental results is also discussed. The magnitude of nonmeteorological errors in diffusion experiments is shown to be as high as plus or minus 50%. The primary causes for these non-meteorological errors lie in the analytical techniques, the loss of particulate tracer material, sampling errors, and uncertainties in source strength. Nevertheless, a limited number of long-range tracer experiments demonstrate that both the SFI and FP tracer techniques can be used to obtain quantitative diffusion data over ranges (greater than 100 km) for which precise knowledge is almost non-existent.##

04988

R. B. Cadle H. S. Johnston

CHEMICAL REACTIONS IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 28-34.

Chemical reactions in smog are either reactions between two or more man-introduced contaminants or between an impurity and the natural components of the atmosphere. This paper discusses (1) certain well-known reactions which must certainly occur, (2) experiments to determine the nature of other reactions expected to occur under conditions which exist in the Los Angeles atmosphere, and (3) speculations about some reactions which may occur. Several investigators have discussed certain types of reactions which possibly occur in smog. Haagen-Smit has suggested that reaction products of olefins with ozone and oxides of nitrogen in the presence of sunlight are responsible for some of the unpleasant properties of smog. Johnstone has discussed the oxidation of sulfur dioxide to sulfur trioxide in the atmosphere, which would result in the formation of a mist of sulfuric acid. Blacet has proposed several photochemical reactions which could contribute to the ozone content of smog; in particular, he considered photoactivation and photolysis of nitrogen dioxide, sulfur dioxide, and aldehydes.##

05575

G. P. Larson, J. P. Taylor, and W. J. Hanaing

STUDIES OF POLLUTION LEVELS IN RELATION TO AIR MOVEMENT IN THE LOS ANGELES ATMOSPHERE. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955, pp. 33-42.

Samples were collected in dustfall jars from a large number of stations in the Los Angeles Basin. The results are plotted in tons per square mile for SO_2, salt, total dustfall, and water insoluble solids. The results of a nitrogen dioxide survey are also plotted showing surface trajectories for air, cross sections, and area distribution. Subsequent to these studies, 50 wind stations were established throughout the basin making it possible to demonstrate the effects of two separate source areas on adjoining areas. To determine the variations that could occur during smoggy periods when one source area might influence the other, the variations in air flow trajectory were studied. CO, nitrogen oxides, and hydrocarbons were measured hourly at several locations in both areas. The oxidation of hydrocarbons to produce eye irritation was also studied. These investigations illustrated the importance of relating the air movement to the sources of pollution, in order to anticipate influences that may be effected in the surrounding areas.##

05511

Altshuller, A. P., S. L. Kopczynski, W. Lonneman, and B. Wilson

PHOTOCHEMICAL REACTIVITIES OF EXHAUSTS FROM 1966 MODEL AUTOMOBILES EQUIPPED TO REDUCE HYDROCARBON EMISSIONS. J. Air Pollution Control Assoc., 17(11):734-737, Nov. 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-8.)

In the summer of 1966, some automobiles from the Cincinnati phase of the GSA study were used in an irradiation chamber study to evaluate the photochemical air pollution potential of

representative models of equipped and unequipped automobiles. Only one set of automobiles, the unequipped Chevelles, produced exhaust capable under irradiation of forming significant levels of oxidant and PAN. Neither the equipped Chevelles nor any of the Fords or Plymouths, whether equipped or unequipped, produced exhaust having the characteristics necessary to form oxidant or PAN upon irradiation. The eye irradiation level reported by the panel upon irradiation of exhaust from unequipped Chevelles was much higher than that produced by the irradiated exhausts from any of the other types of automobiles. Overall, there does appear to be some small improvement with respect to eye irritation in comparing equipped automobiles with unequipped automobiles. To a large extent, the improvement in the air pollution potential of exhausts from equipped Chevelles compared to the unequipped Chevelles can be attributed to the reduction in the hydrocarbon to nitrogen oxide ratio. The irradiated exhaust from equipped Chevelles, except for aldehyde levels, is about the same in photochemical air pollution potential as are the exhausts from unequipped Fords and Plymouths. Such irradiation chamber measurements are related to exhaust reactivities. Hydrocarbon reactivities can be obtained by direct measurement of reactive and nonreactive hydrocarbons in the automotive emissions.##

05617

E. R. Stephens

THE REACTIONS OF AUTO EXHAUST IN SUNLIGHT. Preprint. (Presented at a Session of the Conf. Air Pollution Research on "Atmospheric Reactions of Constituents of Motor Vehicle Exhaust," Los Angeles, Calif., Dec. 5, 1961.)

When auto exhaust is diluted with air and exposed to sunlight chemical changes take place which lead to a variety of noxious products. Among these are eye irritants, plant toxicants, and aerosols. These effects can also be observed when dilute mixtures of hydrocarbons, nitrogen oxides, and sulfur dioxide with air are irradiated. A number of the noxious products have been identified. Ozone and a new series of compounds called the peroxyacyl nitrates (PAN) are the principal plant toxicants formed by this reaction. The various members of the PAN family are powerful eye irritants as are the formaldehyde and acrolein produced in this oxidation reaction. The formation of products such as PAN and alkyl nitrate indicates the presence of organic free radicals since these compounds most probably arise through the reactions of the appropriate radicals with nitrogen dioxide. The corresponding reactions with nitric oxide probably lead to its oxidation to nitrogen dioxide, a phenomena which is observed and which is required to account for the formation of ozone. (Author abstract)##

05618

E. R. Stephens, W. E. Scott, P. L. Hanst, and R. C. Doerr

RECENT DEVELOPMENTS IN THE STUDY OF THE ORGANIC CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at a Session on Smoke and Fumes, 21st Midyear Meeting, ((American Petroleum Inst., Division of Refining, Montreal, Canada)), May 16, 1956.)

A long-path IR cell, with which it is possible to detect many compounds in the air at concentrations in the parts-per million range, is being used to study reactions of air pollutants. Field studies of the Los Angeles smog by other investigators have shown that photochemical reactions caused by sunlight play an important role in its development. In the laboratory it has been demonstrated that O3 is formed when mixtures of NO2 and an organic compound in air are irradiated with artificial sunlight. This paper presents the results of further studies on this and other reactions of air-pollution chemistry. IR analysis of the products of the photochemical reaction between NO2 and an organic compound frequently reveals, in addition to bands of known compounds, several unidentified absorption bands which apparently belong to a single compound produced in significant quantity. Although this compound is unstable, moderately pure samples of it can be condensed if the reaction products are drawn through a cold trap. Physical and chemical properties of this condensate, referred to as compound X, are consistent with the belief that it is an acyl-nitrogen compound, but its structure is not unequivocally determined. The importance of compound X in an explanation of the chemistry of the atmosphere is stressed. O3 is formed when compound X is irradiated, with or without added gasoline. O3 formation is slower with added gasoline, perhaps because the olefins present in the gasoline react with some of the O3. O3 is also formed when nbutyl nitrite is photolyzed in O2. The rate of formation of O3 was only slightly changed when SO2 was present in an irradiated mixture of olefin and NO2. Since the SO2 disappeared very slowly, it was concluded that neither the O3, the free radicals, nor any peroxides which are formed will oxidize SO2 to SO3 at a significant rate. (Author abstract modified)##

06041

R. Reiburger

METEOROLOGICAL ASPECTS OF OXIDATION TYPE AIR POLLUTION. (In: The Rossby Memorial Volume.) California Univ., Los Angeles, Dept. of Meteorology. 1959. pp. 158-69.

The replacement of coal by petroleum products as an energy source, instead of eliminating air pollution, has led to a new type of air pollution characterized by the presence of oxidizing substances, chiefly ozone, and the occurrence of eye irritation, damage to vegetation, and reduction in visibility. It has been shown that photochemical reactions involving hydrocarbons and nitrogen dioxide in concentrations of a few parts per million can produce all these manifestations. The photochemical reactions require the combination of (1) sources of reagents, (2) conditions which prevent their dispersal, and (3) adequate solar radiation. The tremendous concentrations of automobile traffic, the exhaust from which is estimated to contain 7 percent of the hydrocarbons put into the fuel tank, in all metropolitan centers in the U.S. constitute sources which are at least as large as industrial sources (refineries). However, only on the subtropical west coasts of continents do the meteorological conditions for accumulation of pollutants, namely persistent light winds and temperature inversions, occur consistently together with adequate solar radiation. The outstanding example of this combination is Los Angeles, California. Studies of the relationship of air trajectories to the smog manifestations in Los Angeles are

presented. These studies demonstrate the contribution of automobile exhaust as a principal source. (Author's abstract)##

06215

Gusts, A. Stoeber, W. and T. Kallai

SYNERGISTIC PROPERTIES OF AEROSOLS (FINAL PROGRESS REPT. JAN. 20, 1961-Nov. 15, 1961) California Inst. of Tech., Pasadena, 49 pp. Nov. 15, 1961.

The general subject of this Report is the interaction of air-borne particulates with gaseous trace components of the atmosphere which leads to their accumulation upon these nuclei and causes what is commonly called "aerosol formation". An understanding of these processes is important because this accumulation of irritating substances may produce their synergistic intensivation, and the growth of these particulates increases their capacity for diffuse light scattering and causes the well-known visibility restriction by smog-like aerosols. The studies reported center on the physical aspects of aerosol formation, particularly on those resulting from photochemical reactions between NO2 and olefinic hydrocarbons. Instrumentation and methods, especially developed for the synthetic production of such aerocolloid systems, are described in detail -- as well as the procedures resulting in the quantative size and mass distribution of such aerosols. Experiments of exploratory nature are discussed which demonstrate that ou ch reaction products form temporary condensates on artificially introduced particulates whenever present during photoactivation.

06402

J. H. Hicks

IMPROVING VISIBILITY DURING PERIODS OF SUPERCOOLED FOG. Army Cold Regions Research and Engineering Lab., Hanover, N.H. (Rept. No. 181.) (Dec. 1966). 40 pp.
CFSTI, DDC: AD 648 464

Six tests of dispersal systems using propane were conducted in Hanover, New Hampshire during winter 1964-65 and a like number in Greenland during summer 1965 mainly on supercooled fogs and in a few instances when air temperatures were within the lower 2 meters at or slightly above freezing. Propane was introduced into the fog as a liquid aerosol to induce spontaneous nucleation either by cooling or by clathrate reaction which may be important in fog modification. The tests show that liquid propane will improve visibility in fogs, is safe to use, and no standby time is needed. The system may be permanently installed with either radio or manually controlled valve units, and is expensive, a cost of $20/hr estimated to keep an airport approach zone clear of fog. Details of the individual tests conducted are given. The dispensing apparatus, flammability tests, and the theory of formation, growth, and precipitation of ice crystals, thermal reaction, and the clathrate concept are discussed. (Author summary)##

06612

A. Goetz and R. Fuerschel

BASIC MECHANISMS OF PHOTOCHEMICAL AEROSOL FORMATION. Atmos. Environ. 1, 287-306 (1967).

A photochemical reactor was applied to studies of the effects of sulfur dioxide humidity, and order of mixing of reactants on the photochemical production of aerosol from 1-octene and nitrogen dioxide in air. The effects of all three parameters are complex but explainable from a few reasonable assumptions, the most important of which is probably that initial contact between the aerosol nuclei and the more polar reactants has a governing effect on the nature of the product. The experimental results presented are obviously still lacking in sufficient detail for formulation of an adequate description of the complex reaction patterns which lead to the formation of photochemical aerosols in the presence of SO2 under various humidity conditions. Nevertheless, the data definitely indicate that the presence of stable particulates is a dominant factor, not only as centers of accumulant formation, but also as local for the concentration of reactant gas molecules (H2O, NOx, SO2) in their immediate environment. The subsequent photoactivation will thus be more efficient at these centers than in the free volume between them. The existence of such localized statistical "order states" appears to be the most likely interpretation for the effect of the contact sequence order between reactants and particles.##

06994

S. Hilsen, G. Fremsdan, P. Warneck

OZONOSPHERIC MODIFICATION BY MISSILE EXHAUST. Geophysics Corp. of America, Bedford, Mass. (GCA Technical Rept. No. 62-14-G. Scientific Rept. No. 3.) 65 pp. (Dec. 1962).

A possible consequence of the increased launching of large rocket missiles is the large-scale local or worldwide modification of the atmosphere, in particular the occurrence of perturbations that might disturb the existing equilibria by causing chain, cyclic, or catalytic processes. This report considers these possible missile exhaust chemically induced changes in the ozonosphere, the lower reactive portion of the atmosphere. The possibility of chain, cyclic or catalytic processes initiated by one of the components in a rocket's exhaust trail that might cause appreciable changes in the composition of the atmosphere is studied. Chain, cyclic, and catalytic type processes are of greatest interest since destruction (or creation) of ozone on the basis of 1 molecule of ozone per molecule of initiating material would require immense amounts of material released into the atmosphere. In particular, possible reactions that occur when large quantities of OH or H radicals are uniformly released into the atmosphere at a height of 30 kms from hydrocarbon - ion systems are considered. Suggestions for experimental work are made in order that some of the preliminary estimates may be rendered less tentative. The results obtained indicated that large scale perturbations of the ozonosphere are possible under certain circumstances.##

07257

Khan, A. U.; J. H. Pitts, Jr.; and E. B. Smith

SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES: THE ROLE OF SINGLET MOLECULAR OXYGEN IN THE PRODUCTION OF PHOTOCHEMICAL AIR POLLUTION. ((Environ. Sci. Technol.)), 1(8):656-657, Aug. 1967. 14 ref.
CFSTI; DDC 675 969

A new mechanism is proposed to explain the rapid conversion of NO into NO 2 with a concurrent disappearance of hydrocarbons and appearance of oxidants in photochemical air pollution. Singlet oxygen generated by triplet energy transfer from strongly absorbing polynuclear aromatic hydrocarbons to normal oxygen produces excited singlet molecular oxygen which attacks olefins to give unstable peroxides. A mechanistic chain is set up involving free radicals generated by decomposition of these peroxides. A solution of differential equations relating to the proposed mechanism yields a set of rate-time curves for NO-NO2-O3 which have the same general characteristics as those observed in actual smoggy atmospheres. The presence of singlet oxygen in urban atmospheres has potentially great implications in the environmental sciences. (Authors' abstract)##

07518

Yantovskii, S. A.; I. Yu. Sidorina, and R. V. Chernyak

CONDITIONS OF SAFE OXIDATION OF TOLUENE BY ATMOSPHERIC OXYGEN. Text in Russian. Neftekhimiya, 5(1):105-111, 1965. 22 refs. Engl. transl. Intern. Chem. Eng., 7(1):104-109, Jan. 1967.

The maximum permissible amount of oxygen and the limiting temperature to assure safe conditions for the liquid-phase oxidation of toluene at pressures from 1 to 20 atmospheres was determined. In order to assure safe conditions for the liquid-phase oxidation of toluene on an industrial scale it is necessary to maintain minimum oxygen concentration after the reactor at about 6%. In order to maintain a constant safe concentration of the toluene - air mixture in the reactor, in which the amount of oxygen can be brought up to 21%, it is necessary to maintain the temperature above the limiting temperature. At 10 ats, the temperature of the reactor should not be less than 130 deg. This value is 15-45 deg below the oxidation temperature of toluene, which is recommended for the optimum conditions.##

09810

Liberti, Arnaldo and Giuseppe Devitofrancesco

EVALUATION OF SULPHUR COMPOUNDS IN ATMOSPHERIC DUST. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris Directorate for Scientific Affairs, Paper 6, Dec. 1967, p. 47-51.

Extensive research on the physical constitution and chemical composition of atmospheric dust and physico-chemical transformation of sulphur compounds is discussed. Surface area was determined for dust collected in various Italian cities by using a gas adsorption technique. The surface area was found to be about 6.2 sq. m./g. Volatile compounds were analysed by infrared spectroscopy. CO_2, CO, CH_4, HBr, N_2O, nitro-compounds, and ethylene were detected. Sulphur content of atmospheric dust was determined by combustion and the sulphate by extraction with dilute mineral acid. No detectable amount of sulphur dioxide and of free acidity was found.##

10018

Pansturstock, Jack C. and Robert E. Pankhauser

THANKSGIVING 1966 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Durham, N.C.; National Center for Air Pollution Control, Publication No. AP-45, 65p, July 1968. 12 refs.

The Thanksgiving 1966 Air Pollution Episode in the Eastern United States is documented in terms of daily meteorology and ambient air quality. Analysis of the available air quality data indicates that the Air Pollution Potential Forecast Program (APPF) of the Public Health Service and Weather Bureau did forecast the stagnation. Meteorological data for selected cities were based on the diurnal average temperature, cloud cover, afternoon mixing depths, average wind speed through mixing depth, ventilation, resultant wind direction and the average surface wind speed. Air quality measurements on the gaseous pollutants sulfur dioxide, oxides of nitrogen, hydrocarbon and carbon monoxide were made daily. Suspended and settling particulate of solids and liquids were also measured diurnally. The high level of air pollution in the eastern U. S. during the period Nov. 24 through 30, 1966, created adverse health effects. Researchers in New York City found an increase in the death rate of approximately 34 deaths per day during the period.

11006

Schmidt, F. H.

METEOROLOGICAL ASPECTS OF ATMOSPHERIC POLLUTION AND ATMOSPHERIC CHEMISTRY. Atmos. Environ., 2(4):423-426, July 1968.

Discussions are made in this report on the following topics: network of stations for measuring background pollution; sampling techniques from the meteorological point of view; meteorological factors influencing the dispersion of atmospheric pollution; boundary layer observations; special pollutants; forecasting pollution problems.##

11052

B. G. Needfall, B. Linsky

A BIOCLIMATOLOGICAL CLASSIFICATION SYSTEM FOR AIR POLLUTION ENGINEERS. Preprint, West Virginia Univ., Morgantown, Dept. of Civil Engineering, 59p., 1968. 21 refs. (Presented

at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-53.)

A method of deriving 3 air pollution potential indexes based on selected climatic data and meso-climatic topographic factors has been developed, though not yet adequately field tested, for use by engineers in choosing between alternate factory sites. Three indexes, one for general air pollution, one for photoreactive air pollutants, and one for fog-reactive air pollutants, the latter two based on the first one plus sunshine and humidity factors respectively, are presented. These indexes vary with locations, not with air pollutants or time. Weaknesses and possible uses of the various stagnation indexes are discussed. (Authors' abstract, modified)##

11225

Hilst, Glenn R.

AN AIR POLLUTION MODEL OF CONNECTICUT. Preprint, Travelers Research Center, Inc., Hartford, Conn., 31p., 1967. (Presented at the IBM Scientific Computing Symposium, Yorktown, Hgts, N. Y., Oct. 24, 1967.)

A working air pollution simulation model for the State of Connecticut is presented. The model is capable of simulating air pollution concentration patterns for conservative pollutants within the state on an hour-by-hour basis, given the time and space variability of the sources of that pollutant within the state, the flux of that pollutant across the State border (also a time and space variable), and the time and space variability of atmospheric flow and diffusion patterns within the state. Reduced to its bare essentials, the problem of predicting air pollution concentrations in any arbitrary volume of the atmosphere requires specification of the following factors: (1) The immediate past trajectory of that volume of air - where has it been? (2) The emissions of pollutant at each locality over which the air has passed during the time of passage - how much pollution has been injected into the volume? (3) The lateral and vertical mixing of pollutants between this volume and adjacent volumes-how much has each incremental input of pollutant been diluted with air or other pollutants during its time of flight? (4) The loss or alteration of the pollutant by chemical reaction, deposition, sorption processes-how much of each incremental input of pollutant has been altered or lost during its time of flight? The Connecticut model structures the first three of these factors.##

11479

Gusev, M. I., and M. S. Gil'denskiol'd, B. K. Baikov, and E. V. Efimova

DETERMINATIONS OF THE COMBINED EFFECT OF TOXIC SUBSTANCES IN PREDICTIONS OF ATMOSPHERIC POLLUTION. (Ob uchete summarnogo deistviya tokischeskikh veshchestv pri prognozirovanii zagryazneniya vozdushnogo bassesna.) Gig. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):89-90, April-June 1968. (11?)) refs.
CFSTI: TT 68-50449/2

several investigations of the combined effect of several pollutants present simultaneously in the atmosphere have been recently made. The results are listed. The data provide convincing proof that as a rule the combined effect of toxic substances in the atmosphere at the levels of limiting and subliminal concentrations are in accordance with the principle of simple summation. Data from many specialized institutes and organizations suggest that in most cases calculations of the expected atmospheric pollution are based on the maximum permissible concentrations established for individual pollutants, so that the results of mathematical determinations are compared only against such standards. There is a definite gap between theory and practice in the establishment of standards for atmospheric pollutants and the application of its recommendations. It is a matter of common knowledge that the implementation of the necessary hygienic measures at an operating enterprise is undoubtedly more complex and difficult than the prevention of marked air pollution at the planning stage. All these considerations point to the necessity for the planner to take account of the complex effects on man of any combination of industrial pollutants discharged into the atmosphere. The results of comprehensive investigations of the reflex effects produced by combinations of substances and the largely uniform findings of such investigations make it possible to recommend, with a high degree of reliability, that for practical predictive purposes the approved formula for calculations of combined effects should be extended to all combinations of substances present in discharges from a specific industrial enterprise or a complex of enterprises.##

19019

Altshuller, A. P.

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(3):515-523, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated: up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants--those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 10% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data

given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased emphasis on atmospheric investigations, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

15108

Hochian, A. H., Frank Bonasanna, Herbert Faigin, and Herman Pinsky

USE OF THE INTEGRATING NEPHELOMETER TO MEASURE AEROSOL FORMATION FROM HYDROCARBONS. Preprint, California Air Resources Board, Los Angeles, 9p.; 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., New York, 1969.)

A recently-designed integrating nephelometer was used in environmental chamber experiments to measure light scattering resulting from the irradiation of different hydrocarbons in the presence of nitric oxide at ppm levels. In some of the experiments, 2 ml of gasoline were used; in others, several individual alkene and aromatic components of gasoline, in concentrations of 2 ppm each, were irradiated separately in the presence of 0.4 ppm nitric oxide for about 5 hrs. Six ppm of some alkanes found in gasoline were also allowed to react individually with 0.4 ppm NO. Several other experiments were performed in which the hydrocarbon was allowed to react with ozone in the dark. Agreement in the amount of light scattering between duplicate runs was excellent. In several cases, large amounts of aerosol were produced while the net oxidant concentrations were at a fairly low level. It was shown that some short-chain olefins, which may be very reactive in producing oxidant and eye irritation, produced little or no aerosol; in contrast, many paraffins which were found to be non-reactive in eye irritation studies produced aerosol. A great many aerosol producers contain seven or more carbon atoms and do not seem to be restricted to any class of hydrocarbon; a possible synergistic action between a short-chain high oxidant producer and a large molecule which produces aerosol seems to be investigated. The agreement between nephelometer readings and visual measurements of visibility was excellent.

15714

WHERE DOES IT ALL GO. Stanford Res. Inst. J., 2[1]6-8, Dec. 1968.

The Environmental Research Department of Stanford Research Institute undertook a global study of the atmosphere. The world and its surrounding atmosphere were considered as a complete system. Estimates were made of the amount of sulfur compounds, nitrogen compounds, organic compounds, and inorganic carbon compounds discharged to the air by automobiles, home furnaces, or power plants. Calculations were made of the amount of the material in the atmosphere. By comparing the two figures it was possible to estimate how effectively nature removes pollutants from the atmosphere. Included in the atmospheric balance was the

account of material contributed by nature since there are natural sources for a wide variety of gaseous materials and particles which are classed as air pollutants when they are emitted by man's activities.

15729

Kosyrev, B. P. and V. A. Dashenov

THE ROLE OF H2O, CH4 AND CO IN ATMOSPHERIC ABSORPTION IN THE INFRARED. (Rol' parov atmosfernykh primesey v poglosheniii infrakrasnoy radiatsii). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(7):738-744, 1969. 8 refs.

The transparency of minor atmospheric impurities is interpreted in the form of a function of the mass of absorbing gas divided by the equivalent mass of gas needed for 50% absorption at a given wavelength. This function fits available data with a scatter of not more than 8%. When taking into account, the non-uniformity of the atmosphere by the effective mass method, the selection of the fitting parameter (n) may lead to significant error in calculating transparency (T). If the average radiation absorption (A) at the center of the nitrous oxide methane and carbon monoxide and bands varies from 10-90%, then (n) may be selected so that the maximum absolute error in calculating transmission will not exceed plus or minus 1%. Taking into account the variability of (n) with the mass of the gas and the pressure reduces the error in calculating the transparency of minor components to plus or minus 5-7%. Calculating the transparency of various air masses in the centers of H2O, CH4 and CO absorption bands indicates the significant role of minor atmospheric components in the attenuation of infrared radiation.

D. MEASUREMENT METHODS

00011

E. Sawicki, T. W. Stanley, and H. Johnson

DIRECT SPECTROPHOTOFLUOROMETRIC ANALYSIS OF AROMATIC COMPOUNDS ON THIN-LAYER CHROMATOGRAMS. Microchem. J., 8(3):257-284, Sept. 1964.

A simple method has been introduced by means of which fluorescence spectra can be obtained directly from a thin-layer chromatogram. The usefulness and sensitivity of the method have been demonstrated for a wide variety of polycyclic compounds. Some of the spectral differences between the dry and wet spots have been found to be useful analytically. The ease of applicability of the method has been proved through the characterization of the spots obtained from the thin-layer chromatogram of a coal-tar-pitch basic fraction. Benzo(h)quinoline, methylbenzo(h)quinoline, dimethyl(or ethyl)benzo(h)quinoline, benz(c)acridine, and methylbenz(c)acridine have been identified in the sample. (Author)##

00036

T.A. Bellar, W.F. Brown, J.E. Sigsby, Jr.

DETERMINATION OF ATMOSPHERIC POLLUTANTS IN THE PART-PER-BILLION RANGE BY GAS CHROMATOGRAPHY: A SIMPLE TRAPPING SYSTEM FOR USE WITH FLAME IONIZATION DETECTORS). Anal. Chem., Vol. 33:1926-1927, Nov. 1961.

A simple procedure is described for the determination of atmospheric pollutants at concentrations as low as 0.1 p.p.b. Hydrocarbons in the part-per-billion range in 100cc. gas samples can easily be determined. A simple trapping system provides for high collection efficiencies over a wide range of flow rates. Most samples can be handled by this system in less than 10 minutes. This collection system is used in combination with analysis by flame ionization gas chromatography. Data are shown for analyses for atmospheric olefins and paraffins derived from automobile exhaust. The general utility of the method is evaluated and described. (Author)##

00051

J. S. Nader H. C. Taivoulou (Co-Chairmen)

SYMPOSIUM - ENVIRONMENTAL MEASUREMENTS - VALID DATA AND LOGICAL INTERPRETATION. Public Health Service.

Cincinnati, Ohio, Div. of Air Pollution and Div. of Water Supply and Pollution Control, July 1966. 332 pp.
GPO: 814-105-12, HEW: 999-AP-15

This collection of papers on air and water environmental measurements contains material pertaining to the data acquisition fields of air pollution. The systems operated by the Los Angeles County Air Pollution Control District and the U.S. Public Health Service (Continuous Air Monitoring Program) are reviewed. Other articles connected with air and air pollution information include those on data acquisition systems for fields of meteorology, physiology, and data interpretation.##

00060

F.J. Woods, R.E. Umstead, J.E. Johnson

A STUDY OF THE IONIZATION PRODUCED BY THE CATALYTIC COMBUSTION OF HYDROCARBONS. NAVAL RESEARCH LAB., Washington, D.C. (NRL Rept. 6316.) Oct. 15, 1965. 15 pp.
CFSTI,DDC: AD 623016

Ionization produced during the catalytic combustion of hydrocarbons has been studied for its usefulness in applications such as chromatographic detection. When a Pt filament is heated above 500 C in an atmosphere containing the hydrocarbon, the formation of ions takes place during oxidation of the compound. The number of ions produced by the hydrocarbons is an exceedingly small fraction of the number of C atoms oxidized and varies widely depending upon the molecular structure of the hydrocarbon and the catalyst temperature. Branched hydrocarbons produce greater ionization than straight-chain compounds, although the mode of oxidation is opposite. H and CO burned in the combustion cell exhibit no ionization current, even when completely oxidized. Because of the marked effect of molecular structure on ionization and the response of the method to low concentrations of hydrocarbons in air, the procedure may find future use as a specific detector in gas chromatography. (Author)##

00068

R.E. Keith

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST. Public Health Service, Cincinnati, Ohio, Division of Air Pollution, PHS-999-AP-5, Nov. 1963, 59p.

A dynamic irradiation chamber facility was designed and built for investigations of irradiated auto exhaust under conditions of continuous mixing. The facility consists of a programmed chassis dynamometer, an exhaust dilution system, a dilution-air purification system, two irradiation chambers, and various exposure facilities. Three variables were considered in this first series of tests: (1) initial exhaust concentration (approximately 13 ppm carbon and 35 ppm carbon), (2) average irradiation time (85 and 120 minutes), and (3) fuel composition (19% and 23% olefins). The effects of varying these test parameters were determined by use of

appropriate test criteria including NO_2 formation rate, oxidant production, total hydrocarbon losses and reaction of specific species, aldehyde production, plant damage, and bacteria kill. Of the three variables studies, the exhaust concentration at the start of irradiation appeared to produce the most significant effects. Fuel composition had a lesser influence on some of the test criteria; very little difference was noted in the effects produced at the two average irradiation times. (Author)##

00097

R. Dressler R. Barchas

CHEMO-ELECTRICAL SENSING DEVICE. Airkem, Inc., New York City, June 1961, 182p.
CFSTI, DDC: AD 262909

This report describes an investigation of the feasibility of utilizing gas adsorption phenomena for the identification and quantitative determination of various gaseous materials. A discussion is presented of the factors influencing the performance of the various components of an experimental gas analyser based on the measurement of characteristic adsorption energies. Reasons are given for the attempted use of this principle in such an instrument together with a theoretical discussion of the basis for concluding the instrument to be non-feasible in practice within the limitations of the original specifications. A review of material obtained from available literature sources as well as information resulting from experimental work is included in this report. (Author)##

00108

A. P. Altshuller

AIR POLLUTION - PART IV - ANALYSIS OF POLLUTANTS. CHAPTER 18 - ANALYSIS OF ORGANIC GASEOUS POLLUTANTS. Preprint, 1966.

The development of analytical procedures for organic gases and vapors has progressed rapidly in recent years. Almost all of these methods are available only as laboratory techniques and very few have yet been adapted for monitoring instruments. The need for total hydrocarbon or organic analysis became evident when it was realized that organic substances and particularly hydrocarbons were important reactants in the photochemical type of air pollution. Ideally, a hydrocarbon analyzer should show little or no response to the unreactive substances and high response to the reactive substances. No analyzer has been developed that can perform such analyses directly on emissions or atmospheric samples; however, subtractive techniques can be used to remove olefins, aromatics, and aldehydes, and to determine these constituents by difference. Mass spectrometry, dispersive and nondispersive infrared instrumentation, and flame ionization analyzers have been applied to analysis for total organics in emissions or in polluted atmospheres. Since each technique entails a different response to various organic substances, considerable care is needed in interpreting and applying the results of such measurements.##

00110

E. Sawicki, T. W. Stanley, W. C. Elbert, J. Hauser and G. McPherson

COMPARISON OF METHODS FOR THE DETERMINATION OF BENZO(A)PYRENE IN PARTICULATES FROM URBAN ATMOSPHERES AND AIR POLLUTION SOURCE EFFLUENTS. Atmospheric Environ. (London) 1, (2) 131-45, Mar. 1967.

Fourteen methods for the determination of benzo(a)pyrene in air and in other complicated mixtures are compared. Many of the methods are introduced in this paper and all have been applied to the determination of benzo(a)pyrene in airborne particulates. The precision and accuracy of the methods, the man-hours of actual work, and the time to complete an analysis are compared. Specific recommendations are given for methods by means of which a high order of selectivity, a maximum amount of information, a considerably reduced analysis time, or a low cost of analytical operation are possible. (Author)##

00122

D. I. Rasmussen and J. E. Sigsby, Jr.

APPLICATION OF SUBTRACTIVE TECHNIQUES TO THE ANALYSIS OF AUTOMOTIVE EXHAUST. Environ. Sci. Technol. 1, 309-16 (Apr. 1967). (Presented before the Division of Water, Air, and Waste Chemistry, American Chemical Society, Atlantic City, N.J., Sept. 12-17, 1965.)

A simple system has been developed for chemical class analysis of hydrocarbons found in automotive exhaust. The technique should prove useful for evaluating the contributions of automotive emissions to photochemical air pollution. A system of scrubbers permits the sample to be analyzed for paraffins, olefins and acetylenes, and aromatics. Benzene may be determined with either the paraffinic or aromatic hydrocarbons. The system may be used with existing standard hydrocarbon analyzers without requiring their modification. (Author abstract)##

00141

A. Adrejewski, L. Dubois, and J. L. Monkman

INSTRUMENTATION FOR AIR POLLUTION MONITORING. Preprint. (Presented at the Annual Symposium AID Division, Instrument Society of America, Houston, Tex., May 11-13, 1966.)

The design of instruments for the continuous measurement of air pollution is discussed. Particular reference is made to two instruments, a carbon monoxide analyzer and a total hydrocarbon analyzer. (Author)##

00142

H. G. Hanneke, J. R. Burkart, and G. L. Contner

ANIMAL EXPOSURE CHAMBERS IN AIR POLLUTION STUDIES. Preprint, 1966.

Recent developments in animal exposure chambers and their use in studying the biological effects of air pollution are described. The various atmospheres studied include irradiated and non-irradiated auto exhaust atmospheres, oxides of sulfur, and oxides of nitrogen. (Author)##

00146

E. Sawicki and J. Pfaff

ANALYSIS OF COMPOUNDS CONTAINING THE P-NITROANILINE PHOSPHOR AND ANALOGOUS GROUPS BY PHOSPHORIMETRY AND BY ROOM-TEMPERATURE AND LOW TEMPERATURE FLUORIMETRY. Preprint. Microchem. J. 12, (1) 7-25, Mar. 1967.

Since aromatic nitro compounds usually give poor absorption spectra and do not fluoresce, and since the nitrophenylhydrazines are useful colorimetric reagents for analysis of a wide variety of compounds, the phosphorimetric properties and the room-temperature and low-temperature fluorimetric properties of these types of compounds were investigated. Results showed that 4-nitrophenylhydrazine could be a valuable reagent for the analysis of aromatic carbonyl compounds present in auto exhaust fumes and that low-temperature fluorimetric trace analysis is a tool well worth exploiting. Most of the aliphatic aldehyde and ketone 4-nitrophenylhydrazones are nonfluorescent but strongly phosphorescent, whereas many of the aromatic aldehyde and ketone 4-nitrophenylhydrazones are nonphosphorescent but strongly fluorescent in solvents of low dielectric constant and are highly fluorescent in all types of solvents at liquid-nitrogen temperatures. Examples are given of compounds that are neither fluorescent at room temperature nor phosphorescent but are intensely fluorescent at liquid-nitrogen temperatures. Phosphorimetry and low-temperature and room-temperature fluorimetry are three powerful complementary tools, each more valuable when used together in trace analytical research than when used singly. (Author)##

00155

Sweeney, R. Patrick and Miles L. Brubacher

EXHAUST HYDROCARBONS MEASUREMENT FOR TUNEUP DIAGNOSIS? In: Vehicle Emissions, Part II, SAE Progress in Technology Series Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 307-316. 5 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

With an activated control program in California and its imminent prospect nationwide, recently attention has been focused on simplifying exhaust hydrocarbon measurement for potential use as a

tuneup garage diagnostic tool. Work has been underway to evaluate new instrumentation and procedures for hydrocarbon measurement suitable for field use. It is concluded that: (1) With a "one minute" cycle, measured emissions seem to correlate adequately with the California procedure; (2) There are prototype instruments which are inherently much less susceptible to environment of use; and (3) For engine diagnostic purposes, the principal uses of hydrocarbon measurements would be: (a) an initial check (almost any engine malfunction raises hydrocarbons, if low, engine does not need tuneup work); and (b) recheck after tuneup (an increase in hydrocarbons indicates a tuneup oversight or error, and the car would then be checked further). (Authors' abstract)##

00188

G. A. Cleaves, T. J. Lemmons, And C. A. Clemons

A LOW-LEVEL AIR SAMPLING AND METEOROLOGICAL SOUNDING SYSTEM. J. Air Pollution Control Assoc. 16, (8) 207-11, Apr. 1966.

A captive-balloon borne radio transmitting device measuring temperature and humidity at desired levels in the lower thousand feet of the atmosphere over a city is described. A companion device which captures a sample of air at a desired altitude and a method of later determining trace gas concentrations in the sample is presented. Temperature, humidity, and methane concentrations in air samples taken above Cincinnati were determined and are presented as examples of the system's capabilities. (Author)##

00203

E. Sawicki, T. W. Stanley, and W. C. Elbert

COMPARISON OF FLUORIMETRIC METHODS OF ASSAY FOR BENZ(C)ACRIDINE AND BENZO(H)QUINOLINE IN URBAN ATMOSPHERES AND AIR POLLUTION SOURCE EFFLUENTS. J. Chromatog., Vol. 26:72-78, 1967.

Five methods for the estimation of benz(c)acridine in urban particulate samples are compared, as are three methods for benzo(h)quinoline. The methods involving thin-layer chromatography followed by some form of fluorimetry are compared with the column chromatographic absorptiometric procedure for aza compounds. Through the quick estimation of benz(c)acridine, the analyst should be able to determine the presence and amount of the polynuclear aza heterocyclic compounds in urban atmospheres and other appropriate samples. (Authors' abstract)##

00219

T. M. Hauser and D. W. Bradley

THE SPECIFIC SPECTROPHOTOMETRIC DETERMINATION OF OZONE IN THE ATMOSPHERE USING 1,2-DI-(4-PYRIDYL)ETHYLENE. Anal. Chem. 38, 1529-32, Oct. 1966.

A new method for the sampling and analysis of ozone in the atmosphere is described. Atmospheric ozone is collected in a solution of 1,2-di-(4-pyridyl) ethylene in glacial acetic acid. The collected ozone reacts with the 1,2-di(4-pyridyl) ethylene to form an ozonide that undergoes cleavage to yield pyridine-4-aldehyde for which a simple spectrophotometric determination was developed. The relationship between the micrograms of pyridine-4-aldehyde generated per microgram of ozone sampled has been determined, so that pyridine-4-aldehyde may be used for calibration. Various other oxidizing or reducing substances do not interfere with the method, at least not in the concentrations in which they are found in the atmosphere. The method offers good sensitivity, reproducibility, and excellent stability for delayed analysis after sampling. (Authors' abstract)##

00229

M. Shepherd, S. M. Rock, M. Howard, and J. Stormes

ISOLATION, IDENTIFICATION, AND ESTIMATION OF GASEOUS POLLUTANTS OF AIR. Anal. Chem. 23(10):1431-1440, Oct. 1951.

Previous attempts to concentrate air pollutants in a cold trap and analyze the concentrates by mass spectrometer have had disappointing results. A new method by which the air of Los Angeles County has been examined combines the isolation of gaseous pollutants on a filter at liquid oxygen temperatures, separation of the isolated frozen concentrate by isothermal distillation or sublimation at low temperatures and pressures, and identification and estimation of distillates by the mass spectrometer. The method is capable of determining as little as 0.0001 ppm of some pollutants from a 100-liter sample of air; with larger samples, 0.000001 ppm of some substances can be determined. The gaseous phase of the Los Angeles smog was found to be of the order of 0.5 ppm of the air. About 60 chemical compounds or families of compounds were identified or tentatively identified, and the amounts of some of these were determined. It was shown that the gaseous phase of the smog was primarily a mixture of hydrocarbons, and of hydrocarbons combined with O, N, and Cl. These hydrocarbons, principally the unsaturated ones, when oxidized with O3 and NO2 in the presence of UV light, produce substances which constitute a large proportion of the smog concentrates. These oxidation products cause eye and respiratory irritations such as are produced by the real smog, and smell like spectra of the smog concentrates may eventually indicate the presence of other irritants. The new method may be applied to special problems in air pollution over large areas or inside industrial plants. (Authors' abstract)##

00230

D.F. Bender, E. Sawicki, R.A. Wilson, Jr.

CHARACTERIZATION OF CARBAZOLE AND POLYNUCLEAR CARBAZOLES IN URBAN AIR AND IN AIR POLLUTED BY COAL TAR PITCH FUMES BY THIN-LAYER CHROMATOGRAPHY AND SPECTROPHOTOFLUOROMETRY. Intern. J. Air Water Pollution, (London) Vol. 8, 611-643, 1964. (Presented at the Air Pollution Symposium, Chicago, Ill., Aug-Sept., 1964.)

The presence of carbazole in urban air samples and of polynuclear carbazoles in certain source samples is shown for the first time. Carbazole is found in the benzene soluble particulate and in the aromatic fraction of the benzene-soluble particulate from urban air. Certain source samples contain 11H-benzo(a)carbazole and 8H-benzo(c)carbazole in addition to carbazole. The already known presence of these polynuclear carbazoles and of 5H-benzo(b)carbazole in coal tar pitch samples can be demonstrated readily with thin-layer chromatography and spectrophotofluorometry in alkaline N,N-dimethylformamide. The characterization procedure consists of two thin-layer chromatographic separations followed by running the fluorescence emission and excitation spectra of the extract of the appropriate spots in neutral and alkaline N,N-dimethylformamide. Samples containing carbazole include the composite benzene-soluble particulate from the air of 150 United States communities, the aromatic fraction of the benzene-soluble particulate from the air of a city, air polluted by coal tar pitch tarring operations, and a coal tar pitch sample. (Author)##

00268

B. H. Wade, J. H. Rose and H. H. Benedict

A METHOD FOR THE DETECTION AND ISOLATION OF TRACES OF ORGANIC FLUORINE COMPOUNDS IN PLANTS. (FINAL REPT.) Stanford Research Inst., South Pasadena, Calif., Southern California Labs. Apr. 1963. 30 pp.

A method for the detection and isolation of submicrogram quantities of organic fluorine compounds from plant materials in the presence of much larger amounts of inorganic fluoride is presented. The procedure consists first of a rapid screening step for use with large numbers of vegetable samples and extracts and, second, of a chromatographic step to isolate and characterize any fluoro-organics found. These methods are developed in light of specific chemical characteristics of organic fluorine compounds as a general class. A modification of Sweep's quantitative submicro fluoride analytical method is presented as applicable to these isolation methods. Microgram quantities of organic fluorine compounds were found in the plant materials investigated but at a level too low for isolation and identification. (Authors' abstract)##

00275

J. E. Dewhurst and C. G. Holbrook

A TEST FOR THE SOOTING PROPENSITY OF TOWN GAS. Inst. Gas Eng. J. (London) 5, (6) 387-400, June 1966.

A new test is described in which the sooting propensity of town gas may be assessed as a Sooting Number. Laboratory tests and district experience have been used to define the maximum Sooting Number that is acceptable for British appliances adjusted for 0% gas. When the appliances are adjusted for other groups, the test burner is similarly adjusted so that the same Sooting Number limit is obtained. A simple method has been developed for calculating the Sooting Number of a gas from its composition. (Authors' summary)##

00277

R. S. Spindt

COMPUTER ANALYSIS OF THE CALIFORNIA CYCLE. J. Air Pollution Control Assoc., 17(3):166-167, Mar. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-72.)

The State of California, through its Motor Vehicle Pollution Control Board, has specified a characteristic driving cycle to be used to evaluate the exhaust gas emissions of a motor vehicle. The standard method of analysis may take several hours to complete. While there are a number of short cuts that have been used, most of these are suspect if "correct" data are to be obtained. If one uses a data logger, then improvement of the analytical capability will permit more extensive data analyses. The California cycle requires measurement of only CO_2, CO, and hydrocarbons by means of nondispersive infrared analyzers. By adding an oxygen analyzer, data on air/fuel ratio can be calculated for each driving condition. The system selected consists of a coupler, scanner, digital voltmeter, recorder, and manual entry keyboard. The driver starts the car and the logger is started before the first acceleration. Data are recorded to the end of the run. The bag sample data (total exhaust gas collection) and final zero and span data are each recorded with their preceding manual entry code in a similar manner. (Author's abstract)##

00293

F. C. Tabor and G. V. Smith

NATURE OF THE BENZENE-SOLUBLE FRACTION OF AIR PARTICULATE MATTER. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper 66-121.)

Annual composites of the benzene-soluble portion of air particulate matter were obtained from suspended particulate samples collected at 78 urban and 12 non-urban stations of the National Air Sampling Network. These samples of benzene-soluble organics were separated into the following functional groups of organic compounds: water-soluble, acids, bases, aliphatic hydrocarbons, aromatic hydrocarbons, and oxy-neutral compounds. Tables are presented showing the composition of the individual samples and frequency distributions of percentage values for the different fractions. Results are discussed and suggestions made concerning causes of unusual results. Infrared absorption curves are presented to illustrate similarities and differences. (Authors' abstract)##

00128

H. Watanabe and T. Nakadoi

FLUOROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ATMOSPHERIC OZONE. J. Air Pollution Control Assoc. 16, (11) 616.7, Nov. 1966. (Presented at the 59th Annual Meeting, Air

Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

This work has initiated in an effort to obtains better method for the manual determination of trace amounts of atmospheric ozone. The method described depends upon the fact that ozone oxidises nonfluorescent 9,10-dihydroacridine to fluorescent acridine. When the ethyl alcohol solution of acridine is acidified by 6N acetic acid, the fluorescence maximum occurs approximately at 402 millimicrons and its intensity is sufficiently strong to be useful in this analysis. Linear relationships between acridine concentrations and fluorescence intensities were obtained from 0.1 to 3.5 micrograms per ml. by measurement with a commercial fluorophotometer. The results indicated that the low concentrations of experimentally prepared ozone measured by this method were in good agreement with those obtained by the phenolphthalin method. This method appeared to be about twice as sensitive as the phenolphthalin method but it is subject to some interference from nitrogen dioxide. (Authors' Abstract)**

00186

E. Sawicki and J. D. Pfaff

QUENCHOPHOSPHORIMETRIC ANALYSIS FOR CONJUGATED COMPOUNDS. Mikrochim. Acta (1-2) 322-33, 1966.

A new method of analysis that incorporates many of the reagents found useful in quenchofluorometry is introduced. Since many types of non-fluorescent and weakly fluorescent compounds can be analysed, quenchophosphorimetry is a complementary tool. This method of analysis is superior to colorimetry and fluorometry in simplicity, sensitivity and selectivity for many types of compounds. Examples of this technique are given. One striking example is the determination of p-nitroaniline in the presence of carbazole, p-hydroxyacetophenone, triphenylamine and tri-phenylene all of which are usually intensely phosphorescent. New types of functional group analyses for individual compounds and families of compounds should be possible with quenchophosphorimetry. (Author)**

00199

W. C. Elbert and T. W. Stanley

A STUDY OF THE ELUTING POWER OF SOLVENT SYSTEMS ON THIN LAYERS OF FLORISIL. Chemist-Analyst, 54, 68-9, July 1965.

This paper presents the results of investigation of the eluting power of single solvent systems on thin layers of Florisil with standards of immediate and future importance in air pollution studies. A polynuclear aromatic hydrocarbon, aza and thia heterocyclic hydrocarbons, an aromatic amine, a quinone, and a ring-carbonyl compound were selected for the study. Clean glass plates (20 by 20 cm) were coated with a 500-micron layer of Florisil from a slurry of 70 ml. of water and 35 g. of substrate, which had been mixed for 1 min. The coated plates were activated at 110 C and stored in a desiccator. Chambers containing the solvent systems were lined on one side with Whatman no. 1 filter paper and allowed to equilibrate for 16

hrs (or over-night) at room temperature. Plates spotted with the standards were allowed to develop to a height of 15-cm.; spots on the developed chromatogram were outlined and the movement of the standards relative to the solvent front was determined by observation under UV light. This study showed that the order of solvents in terms of development on a plate varies with the type of compound being separated. Because of this phenomenon, two-dimensional development on a Fiorisil plate can be useful in the separation and analysis of organic airborne particulates.##

00426

G. Lundeen and R. Livingston

CHEMILUMINESCENCE OF HYDROCARBON OXIDATION. Photochem. Photobiol. Vol. 4:1085-96, 1965.
CFSTI, DDC: AD 631111

That chemiluminescence accompanies autoxidations and decompositions of some peroxides has been known for some time. Recently mechanisms have been proposed to explain such chemiluminescence. This paper is a report of an experimental study of the luminescence which accompanies the autoxidation, spontaneous and induced by the decomposition of benzoyl peroxide, of tetralin and aryl benzene. Anthracene, 9,10-diphenyl anthracene and 9,10-dibromo-anthracene were used as intensifiers of luminescence.##

00440

R. Sawicki and R. Johnson

CHARACTERIZATION OF AROMATIC COMPOUNDS BY LOW-TEMPERATURE FLUORESCENCE AND PHOSPHORESCENCE: APPLICATION TO AIR POLLUTION STUDIES. Microchem. J. 8(1):85-101, Mar. 1964.

Characterization through low-temperature fluorescence and phosphorescence properties of aromatic molecules under neutral, acid, and alkaline conditions has been investigated. Compounds that are fluorescent at room temperature are usually fluorescent at liquid-nitrogen temperatures. Many polar compounds that are nonfluorescent at room temperature become strongly fluorescent at low temperatures. Many azulene and azo derivatives that are not fluorescent under neutral conditions give vivid fluorescence under liquid nitrogen. Many of the investigated compounds have vivid phosphorescence properties. Many of the compounds show differences in fluorescence and phosphorescence dependent on whether they are dry or in solution on the paper. Both paper and thin-layer chromatograms can be examined for room-temperature fluorescence, low-temperature fluorescence, and phosphorescence in neutral, acid, or alkaline media. Examples of the more difficult thin-layer chromatogram procedure with air pollution samples are given. An example of an applied paper-chromatographic procedure is given also.##

00449

H. Konosu and T. Hashika

TECHNICAL ANALYSES BY OPTICAL METHODS (XI) DESIGN OF A NONDISPERSIVE ULTRAVIOLET GAS ANALYZER AND ITS APPLICATION TO QUANTITATIVE MEASUREMENT OF TRACES OF TOXIC GASES AND VAPORS IN AIR.) Tokyo Kogyo Shikensho Hokoku 61(2):62-68, Feb. 1966., Text in Japanese

Details of a nondispersive ultraviolet gas analyzer, designed to determine traces of toxic gases and vapors in air, are presented. The analyzer measures small transmission differences between a standard gas and the sample gas. The principal parts of the instrument are an ultraviolet source (hydrogen discharge lamp), a double-beam optical system, measuring cell of 50 cm length, a secondary electron photomultiplier detector, and a measuring meter (ammeter). The sensitivity of detection in ppm for gas and vapors in 50 cm cell is: SO_2-3, CS_2-28, C_6H_6-27, $C_6H_5CH_3$-32, $CH_3COC_2H_5$-36, CH_3CCl_3-13. This method has a precision to plus or minus 2.0% for the range of 0-100 ppm, to plus or minus 4.0% for 100-1,000 ppm and to plus or minus 7.5% for 1,000-1,250 ppm SO_2. The equipment is relatively simple, and its rapid response permits measurements to be made in less than 1 minute. (Author summary)

00451

H. Sakabe, H. Matsushita, H. Hayashi, K. Hosaki, Y. Suzuki

MINERAL COMPONENTS AND 3,4-BENZPYRENE IN AIR POLLUTANTS OF TOKYO. Ind. Health (Japan) 3(3-4):126-139, Dec. 1965.

Minerals and 3,4-benzpyrene in particulate pollutants in winter air of Tokyo were studied by the methods developed by the authors. Minerals in air pollutants of Tokyo were quartz, feldspar, cristobalite, mica and kaolin minerals which were the mineral assemblage of Kanto loam constituting earth surface of Kanto plain. The highest concentration of quartz in the air during this survey was 0.019 mg/cu M and mean concentration of 3,4-benzpyrene in Tokyo air was 15.1 micrograms/1000 cu M. Data were discussed in relation to "Toky/-Yokohama asthma" and lung fibrosis. (Authors' abstract)##

00469

G.B. Jones, N.W. Parkin, J.G. Ringle, W.H. Paul

THE FATE OF OXIDES OF NITROGEN THROUGH A DIRECT FLAME AFTERBURNER IN THE EXHAUST OF A GASOLINE ENGINE. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland Oreg., Nov. 5-6, 1964, Paper No. 64-AP-10.)

This paper deals with a study which was made to determine the concentration of N oxides before and after a direct-flame afterburner connected to the exhaust of an internal-combustion

engine. The scope of the work covered in this investigation is being confined to a single engine and one afterburner. The laboratory setup consisted of a 6-cylinder overhead camshaft engine direct-connected to an electric dynamometer. Steel flywheels mounted on the dynamometer shaft made possible the simulation of vehicle road operation during acceleration and deceleration. Operation of the engine was automatically controlled to the California seven-mode cycle. Analysis of NOx was accomplished by drawing exhaust gas samples every 2-1/2 sec during the 139 sec of the 7-mode cycle. NOx determinations were made by an instrument partially designed and totally built at Oregon State University. Other constituents of the exhaust gas (CO, CO2 and unburned hydrocarbons) were recorded with continuous, nondispersive infrared detectors. Plotted profiles of instantaneous NOx concentration during the 7-mode cycle time show results before and after the direct-flame afterburner for both rich and lean mixture operation.##

00479

P. Gavicki, T. W. Stanley, D. McPherson, and R. Morgan

USE OF GAS-LIQUID AND THIN-LAYER CHROMATOGRAPHY IN CHARACTERIZING AIR POLLUTANTS BY FLUOROMETRY. Talanta Vol. 13:619-629, 1966.

Relatively large amounts of alkylated derivatives of the polynuclear aromatic hydrocarbons are present in some urban atmospheres. These compounds are believed to be derived from industrial sources. Because alkylation of the tetracyclic aromatic hydrocarbons can confer carcinogenic activity on the derivatives, the presence of substantial amounts of these alkylated compounds in the air needs thorough study. The R sub F value and the retention time, by themselves, are inadequate for characterization of the polynuclear compounds. Gas liquid chromatography followed by fluorometric examination of the eluent bands, and mixed-adsorbent two-dimensional thin-layer chromatography followed by direct fluorometric examination are very useful in characterizing all types of organic compound in the organic fractions of airborne particulates and effluents from air pollution sources. (Author Abstract)##

00488

Holma, B.

SHORT-TERM LUNG CLEARANCE IN RABBITS EXPOSED TO A RADIOACTIVE BI-DISPERSE (6 AND 1 MICRON) POLYSTYRENE AEROSOL. In: Inhaled Particles and Vapours II. (Proc. Intern. Symp. Brit. Occupational Hyg. Soc., Cambridge, England, 28 Sept.-1 Oct. 1965.) C. N. Davies (ed.), London, Pergamon Press, 1967, p. 189-203. 8 refs.

This paper presents a technique for external measurement which can be used for studying the rate of lung clearance for two monodisperse aerosols, i.e. a "bi-disperse" aerosol simultaneously in a single animal. Using this technique, the lung clearance of 6 micron and 1 micron polystyrene particles, tagged with Au(198)

and Sr(90) respectively, has been studied in 8 rabbits for 90 hours after exposure. The results show that the clearance rate is faster for the larger than for the smaller particles. (Author abstract)##

00892

F. E. Ordovasa and P. W. West

MICRODETERMINATION OF CAFFEINE USING THE RING OVEN TECHNIQUE. Anal. Chim. Acta Vol. 30:227-231, 1964.

A rapid and highly selective method for the microdetermination of caffeine of special interest for air pollution studies is presented. With the ring oven technique and with solutions of acetylacetone in sodium hydroxide and p-dimethylaminobenzaldehyde in hydrochloric acid, as little as 0.5 microgram caffeine on the ring can be determined with an average error of 3%. Compounds containing purine bases which would be likely to give the same color reaction as caffeine do not interfere. Of the organic air pollutants which might be collected from the atmosphere during the sampling for caffeine, benzo(alpha)pyrene and formic acid do not interfere. Interferences from formaldehyde and urea are easily eliminated. (Authors' summary)##

00943

T.A. Keller J.E. Sigsby, Jr.

EVALUATION OF VARIOUS SILICA GELS IN THE GAS CHROMATOGRAPHIC ANALYSIS OF LIGHT HYDROCARBONS. Environ. Sci. Technol. 1(3):242-246, March 1967. (Presented at American Chemical Society, Pittsburgh, Pa.; Mar. 21-24, 1966.)

The paper describes the separations of light hydrocarbons obtained with columns packed with the following Davison silica gels: Types No. 08, 15, 35, 58, 62, 81, 113, and 950. Experimentally these silica gels were classified in 2 groups: (1) high-activity silica gels with average pore diameter around 25 angstroms, and (2) medium-activity silica gels with average pore diameter around 150 angstroms. Light-hydrocarbon chromatograms characteristic of the 2 groups are shown. The effects of various polar liquid phases and water upon the silica gels of 150 angstroms pore diameter are discussed in detail. A system is described that can be used for analysing C1 to C5 paraffins, C2 to C4 olefins, and acetylene in automotive emissions and in ambient air. Some of the advantages of using solid adsorbents for such analysis are also discussed. (Author's abstract)##

00588

C.A. Clemons A.P. Altshuller

PLASTIC CONTAINERS FOR SAMPLING AND STORAGE OF ATMOSPHERIC HYDROCARBONS PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS. J. Air Pollution Control Assoc. 15, (10) 467-8, Oct. 1965.

The results of the present work indicate that Mylar containers should prove adequate for sampling and long-term storage of C1 to C5 aliphatic hydrocarbons prior to gas chromatographic analysis. Long-term storage of aromatic hydrocarbons in these containers should be avoided. Containers made of plastic films fabricated from various fluorinated polymeric materials may prove more useful for the storage of aromatic hydrocarbons. Difficulties in storage of atmospheric samples containing higher-molecular-weight hydrocarbons or polar substances for periods of weeks should not deter workers from using these containers for short-term storage of synthetic calibration mixtures or atmospheric samples. Mylar containers have proved satisfactory for storage of a wide variety of reactive substances for periods of a few hours to several days. (Authors' abstract)##

000610

A. P. Altshuller

ATMOSPHERIC ANALYSIS BY GAS CHROMATOGRAPHY. Preprint, 1966.

A number of the gas chromatographic procedures developed for atmospheric analysis have received little application. Several investigators have done atmospheric analysis for hydrocarbons and peroxyacetyl nitrate directly without concentration. Monitoring gas chromatographs could be built for obtaining large quantities of atmospheric analyses. Such equipment has not yet been fabricated. A related problem is the read-out of the large number of peaks or areas generated by making analyses every 10, 15 or 30 min, for 24 hrs a day. Integration equipment capable of handling such outputs is available; such equipment is already in routine use in measuring hydrocarbons in auto exhaust studies. The application of the electron capture detector to analysis of low-molecular-weight halogenated substances, pesticides, and tracer materials in air has been demonstrated. The capability to measure such substances by gas chromatography is excellent. Many future applications in atmospheric chemistry should make use of such procedures. (Author abstract)##

000620

W.B. Cronn J.S. Nader

AIR SAMPLING WITH PLASTIC BAGS. Am. Ind. Hyg. Assoc. J. Vol. 25:291-297, June, 1964.

An inexpensive sampler has been developed whereby air samples can be collected in plastic bags without puny contamination and shipped to a laboratory for analysis. Data are presented to illustrate how well these bags contain (1) sulfur dioxide, nitrogen dioxide, and ozone in samples collected from synthetically prepared mixtures, and (2) hydrocarbons in samples collected from an auto exhaust irradiation chamber. The inorganic samples were in the concentration range of 0.5 to 1.5 ppm, and the hydrocarbon samples were in the concentration range of 7 to 20 ppm. The samples were stored for periods of several days. (Author abstract)##

00623

G.C. Ortman

CONTINUOUS SELECTIVE MONITORING OF HYDROCARBONS; APPLICATION TO DETERMINATION OF METHANE. Preprint. 1966.

Described is an instrument system for selective monitoring of trace hydrocarbons. It is comprised of sample pump, treated column of adsorbent material, hydrogen flame ionization detector, electrometer amplifier, and recorder. In operation a continuous flow of sample air is pumped through the column to the detector. The column removes unwanted hydrocarbons while passing unaltered the one of interest. A prototype field instrument for monitoring atmospheric methane is detailed and typical results characterizing its operation reported. Response is linear and independent of the direction of change of the measured variable. Principles, design factors, application, and performance of the system are discussed and experimental data presented. (Author abstract)##

00624

E. Sawicki, T. W. Stanley, W. C. Elbert

CHARACTERIZATION OF POLYNUCLEAR AZA HETEROCYCLIC HYDROCARBONS SEPARATED BY COLUMN AND THIN-LAYER CHROMATOGRAPHY FROM AIR POLLUTION SOURCE PARTICULATES. J. Chromatog. Vol. 18:513-519, 1965.

By column and thin-layer chromatography approximately 300 spots have been obtained in the analysis of various air pollution sources. With the help of direct spectrophotofluorometric analysis of the spots on the thin-layer chromatograms 25 aza heterocyclic and 8 polynuclear aromatic hydrocarbons were characterized according to the present ring structure. Eleven of the aza heterocyclic hydrocarbons were identified unequivocally. The following carcinogens have been found in air pollution source effluents: dibenz(a,h)acridine and dibenz(a,j)acridine. In addition, alkyl derivatives of benz(a)acridine and benz(c)acridine were obtained, some of which could be carcinogenic. (Author summary)##

00625

S.S. Epstein R. Bush

A SINGLE PHOTODYNAMIC ASSAY FOR POLYCYCLIC ATMOSPHERIC POLLUTANTS. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-111.)

The photodynamic bioassay employed in this study is simple, rapid, and reproducible. However, the significance of data acquired with this technique is, at present, not easy to interpret. It appears that the assay provides an in vivo measure of the concentration of photosensitizing compounds in atmospheric

particulates, and yields results which discriminate between pollutant fractions from the same source, and between pollutants from different sources. Whether these differences would be paralleled in non-composite samples cannot be assessed at present. The inter-source variations cannot be accounted for merely by a concomitant difference in the concentration of atmospheric particulates. Although there appears to be a general association between the BaP concentration and photodynamic potency of benzene-soluble extracts, the chemical data are, at present, too restricted for more meaningful correlations. Apart from this, while the presence of BaP may account for the major part of the potency of benzene-soluble and aromatic fractions, it obviously does not account for photodynamic potency in oxy-neutral or basic fractions. Both these fractions are frequently very potent and while largely chemically undefined, are devoid of BaP. The presumptive isolation of carcinogenic alkylated benz(c)acridines from basic fractions probably accounts for their occasional high potency and should serve to direct biological attention to this small but, hitherto, largely ignored fraction. (Author's summary modified)##

00767

B.D. Stewart, H.C. Dodd, D.S. Riley, B.B. Holder

DIAGNOSIS OF SOLVENT POISONING. J. Am. Med. Assoc., 193(13):1098-1100, Sept. 27, 1965.

The diagnosis of solvent poisoning or exposure can be rapidly established by breath analysis. The analytical methods employed specifically identify the solvent and are sufficiently sensitive to permit detection hours to weeks after exposure, depending upon the amount of solvent absorbed, its rate of metabolism, and its rate of excretion. Serial breath analyses after a solvent exposure allow the construction of an excretion curve which can then be compared to the excretion curves of humans previously exposed to known amounts of a given solvent. In this manner the total body burden or total body burden of total amount absorbed may be estimated. Based upon the identity of the toxic agent and the amount present within the body, a reasonable prognosis can be advanced and appropriate therapy begun. The breath samples are collected in Saran gas bags or glass pipettes and analyzed directly for their solvent content in a long path-length gas cell of an infrared spectrometer or in a vapor phase chromatograph. (Authors' abstract)##

00765

K. Saviehi, D.F. Bender, T.R. Hauser, H. R. Wilson, Jr., J.E. Keeler

FIVE NEW METHODS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF ALKYLATING AGENTS INCLUDING SOME EXTREMELY SENSITIVE AUTOCATALYTIC METHODS. Anal. Chem. 35(10):1479-86, Sept. 1963.

The presence of alkylating agents in the air and in various air pollution sources has been demonstrated with the new reagents. Because of the wide range of toxic effects caused by alkylating agents, a more thorough investigation of the composition of the

air in terms of alkylating agents is necessary. Four new sensitive reagents for the determination of alkylating agents are introduced. A much more sensitive 4-(4-nitrobenzyl)-pyridine procedure is described for the determination of the relative reactivity of over 90 alkylating agents. A new type of spectrophotometric method for the analysis of organic compounds involves an autocatalytic reaction for determining alkyl iodides in trace quantities. For example, in the 4-pyridinecarboxaldehyde 2-benzothiazolylhydrazone procedure for the determination of 1-iodobutane a molar absorptivity of 1,500,000 can be obtained. The determination limit is about 50 nanograms of 1-iodobutane. These reagents can be used to determine very low concentrations of iodine and iodine precursors through an autocatalytic reaction. For example, in the determination of iodine with 4-pyridinecarboxaldehyde 2-benzothiazolylhydrazone a molar absorptivity of 6,000,000 can be obtained. The determination limit for iodine with this reagent is 15 nanograms. Several new methods use the new reagents for the detection of acylating agents. The relative activity of many functional groups is discussed. (Authors' abstract)##

00766

J.D. Pfaff E. Sawicki

DIRECT SPECTROPHOSPHORIMETRIC ANALYSIS OF ORGANIC COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS. Chemist-Analyst, 54(1):10-11, 1965.

Author discusses the advantage of phosphorimetric analysis of organic compounds and concludes that it is a more sensitive and more selective method of analysis.##

00767

E. Sawicki H. Johnson

THIN-LAYER CHROMATOGRAPHIC CHARACTERIZATION TESTS FOR BASIC POLYNUCLEAR COMPOUNDS. APPLICATION TO AIR POLLUTION. Mikrochim. Acta (Vienna), (2-4) 835-50, 1964.

A group of methods for the characterization and differentiation of various classes of basic aromatic compounds has been described. Polycyclic hydrocarbons, aromatic carbonyl derivatives, aromatic ring carbonyl compounds, azo heterocyclic compounds, and polycyclic aromatic amines show changes in fluorescence color with sulfuric acid on the thin-layer plate and in solution. The piperonal color test gave some selective reactions on the thin-layer plates with various polycyclic aromatic hydrocarbons. A trifluoroacetic color test for oxidizable aromatic compounds containing nitrogen atoms was investigated. Compounds containing carbazole rings gave positive results. The piperonal test, the trifluoroacetic acid oxidation test, and the trifluoroacetic acid test for compounds more basic than the hydrocarbons were applied to the study of the spots separated through thin-layer chromatography of organic airborne particulates. Carbazole in amounts greater than 0.03% in an organic air sample could be estimated after thin-layer chromatography. With the help of thin-layer chromatography and the trifluoroacetic acid vapor test, organic airborne

particulates were found to contain fairly large amounts of compounds more basic than the polycyclic hydrocarbons. A spectral procedure for characterizing and differentiating aromatic hydrocarbons, aromatic carbonyl derivatives, azo heterocyclic compounds, and aromatic amines has been described. (Author summary modified)##

00768

D.F. Bender; E. Gavicki; R.R. Wilson, jr.

SPECTROPHOTOMETRIC DETERMINATION OF ALKYLATING AGENTS WITH 4-PICOLINE AND 2-DINITROBENZENE. Analyst, 90(1075):630-634, Oct. 1965.

An accurate, sensitive spectrophotometric method has been developed for determining alkylating agents. The method involves the alkylation of 4-picoline at 100 C in 2-methoxyethanol, with subsequent reaction of the 4-picolinium cation with 2-dinitrobenzene in the presence of alkali to produce the chromogen. With 2-phenylethanol as the solvent, the method is autocatalytic at 100 C. The variables in the procedures were studied, and the methods were compared to one another and to methods in literature. Some preliminary studies of other possible methods for alkylating agents are discussed. (Authors' abstract)##

00772

T.A. Bellar; R.L. Bellar; J.E. Sigsby, jr.

GAS CHROMATOGRAPHIC ANALYSES OF PARAFFINS AND OLEFINS IN COMPLEX HYDROCARBON MIXTURES: CHEMICAL FRACTIONATION WITH DUAL HIGH-CAPACITY TUBULAR COLUMNS. Preprint. (Presented at Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pa., Mar. 2-6, 1965.)

Auto exhaust and other complex hydrocarbon samples are analyzed directly for over 60 paraffins and cycloparaffins and numerous olefins in 70 minutes. By means of a unique valving system, a sample of exhaust is separated into two fractions by a silver nitrate-ethylene glycol column and each fraction is trapped individually. The fractions are then analyzed simultaneously on separate columns, one fraction for paraffins and cycloparaffins and the other for olefins. The latter fraction also contains the remaining hydrocarbons of the exhaust sample excepting aldehydes and acetylenes, which appear to react irreversibly with the fractionating column. (Authors' abstract)##

00845

SELECTED METHODS FOR THE MEASUREMENT OF AIR POLLUTANTS. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1965. 53 pp.
GPO: 020-519, HEW: 999-AP-11

This manual is an effort to assist in the development of uniform standard methods of analysis of air pollutants. It makes available the judgment and knowledge of a large group of chemists in the Public Health Service. Methods of determining pollutants of common interest are presented in uniform format by chemists on the staff of the Division of Air Pollution. The methods were critically reviewed by the Interbranch Chemical Advisory Committee, which is composed of representatives of the professional chemical groups in all branches of the Division. Methods presented are as follows: For determination of sulfur dioxide, the West and Gaeke and the hydrogen peroxide methods; for determination of nitrogen dioxide and nitric oxide, the Saltzman method; for determination of oxidants, the neutral buffered-potassium iodide and the alkaline potassium iodide methods; for determination of aliphatic aldehydes, the 3-methyl-2 benzothiazolone hydrazone hydrochloride method; for determination of acrolein, the 4-hexylresorcinol method; for determination of formaldehyde, the chromotropic acid method; for determination of sulfate in atmospheric suspended particulates, the turbidimetric barium sulfate method; and for determination of nitrate in atmospheric suspended particulates, the 2,6 xylenol method. (Author abstract)##

00862

R.A. Young

GENERATION AND DECAY OF SMALL IONS. SECTION IV: THE CHARGING AND MOBILITY OF CHAIN AGGREGATE SMOKE PARTICLES (PROGRESS REPT.). Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering. (Particle Lab. Publication No. 95.) June 1, 1966.

Using a modified electrical particle counter, an experimental study was made of two typical linear aggregate aerosols. These were an aerosol generated by exploding a fine copper wire with a high current pulse and one produced by the burning of a mixture of kerosene and benzene in air. The electric charge acquired by the particles by diffusion of ions in a pure diffusion charger, the electrical mobility of the particles, and their size, were measured and correlated. This information was then used to calculate the dynamic mobility of the particles and the charge-size relationship. The charge acquired by spherical methylene blue dye particles under similar charging conditions was also measured and compared to the data on chain aggregates.##

00867

E. Sawicki, T.W. Stanley, T.R. Hauser, W. Elbert, J.I. Noe

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF AROMATIC AMINES AND IMINO HETEROAROMATIC COMPOUNDS WITH 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE. Anal. Chem. 33(6):722-725, May 1961.

A new analytical method is introduced for the detection and determination of organic compounds containing the aromatic amine grouping. Among these compounds are the aromatic primary amines,

alkyl amines, aryl dialkylamines, diarylamines, indoles, carbazoles, and phenothiazines. In a preliminary survey of this reaction, limits of identification, wave length maxima, and molar absorbance values have been given for approximately 100 compounds. Noteworthy were the brilliant intense colors obtained with aniline, N-alkylanilines, and N,N-dialkylanilines and their ring-substituted derivatives. Many carcinogenic amines were found to be capable of analysis by the colorimetric method. The colorimetric determination of N,N-dimethylaniline was studied and found to be extremely sensitive and reproducible. Beer's Law was obeyed from 4-64 micrograms of N,N-dimethylaniline/ml of test solution. The shortcomings and limitations of this procedure are also discussed. In an alternative procedure modified for use only with the basic aromatic amines Beer's Law was obeyed from 0.8 to 8 micrograms of N,N-dimethylaniline/ml of test solution. The absorptivity of the chromogen obtained from N,N-dimethylaniline was 0.70/ microgram ml/cm. (Author summary)##

00068

E. Sawicki J.D. Pfaff

ANALYSIS FOR AROMATIC COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS BY SPECTROPHOTOPHOSPHORIMETRY, APPLICATION TO AIR POLLUTION. Anal. Chim. Acta Vol. 32:521-543, June 1965.

A new technique is introduced in spectrophosphorimetric analysis by means of which spectra can be obtained directly on an adsorbent after chromatography. With this procedure spectra of the phosphorescent compound, its salts, its reduced or oxidized forms, or its derivatives can be obtained in all types of solvents. A large number of examples of this simple technique are given; detection limits range from 0.1 nanogram to microgram amounts. A new system for the circular paper chromatographic separation of azo heterocyclic hydrocarbons using aqueous formamide is described. Many of these heterocyclic compounds can be separated from each other as can the parent compounds from their alkyl derivatives. Air pollution mixtures separated by column and paper chromatography are analyzed with the phosphorimetric technique. Spots obtained on the paper chromatograms are analyzed directly in the phosphorimeter. With these techniques benzo(f)quinoline, benzo(h)quinoline, benz(a)acridine, benz(c)acridine, and hydrocarbons such as phenanthrene and benzo(e)pyrene are rapidly characterized. (Author summary)##

00090

M.P. Chovin M.J. Lebbe

(AN EFFECTIVE WORK INSTRUMENT: THE LABORATORY TRUCK USED BY THE MUNICIPAL LABORATORY OF PARIS IN A STUDY OF AIR POLLUTION.) Un Instrument de Travail Efficace: le Camion-laboratoire d'Etude de la Pollution Atmospherique du Laboratoire Municipal de Paris. Pollut. Atmos. (Paris) 8(29):1-11, Mar. 1966.

A Paris Municipal laboratory truck used for air pollution studies, principally for automobile emission studies, is described. This mobile laboratory which was set up in 1961 by the Technical Services Department of the Prefecture of Police, helped in a long-term series of studies known as "Operation Carbon Monoxide". It gave great mobility to these studies, and because of the relatively small size of the truck, it could be parked without interfering too much with normal traffic. It was a Citroen H with a lengthened body and a reinforced suspension. It was equipped so that the instruments could be operated either with batteries or a central supply of electricity. It was thermally insulated to protect the instruments. The roof was reinforced so that meteorological observations could be made with instruments mounted on top, or the area could be used for visual observations. Scientific equipment in the truck consisted of an analyser for carbon monoxide (infrared, automatic), a carbon dioxide automatic analyser, a Perkin Elmer apparatus for unburned hydrocarbons, as well as a Mohatoff apparatus, other types of apparatus specific for sulfur oxides and hydrogen sulfide, equipment for gas phase chromatography and a pump for a Millipore filter. All equipment was mounted on special shock absorbers. The cost was about 200,000 francs.##

00911

E. D. Barber E. Sawicki, and S. P. McPherson

SEPARATION AND IDENTIFICATION OF PHENOLS IN AUTOMOBILE EXHAUST BY PAPER AND GAS LIQUID CHROMATOGRAPHY. Anal. Chem., 36(5):2492-2495, Dec. 1964.

MEASUREMENT METHODS; Automotive exhausts, Gas chromatography, Paper chromatography, Phenols

A method is described for the separation and identification of simple phenols in automobile exhaust by paper and gas liquid chromatography. Extended data are given on the separations in Crump's system on Schleicher and Schuell 2040A and 15 to 40% silica gel-impregnated 966 papers as well as separations on dimethylformamide-impregnated papers in dimethylformamide-hexane. The results of analysis of several samples by paper and gas liquid chromatography are presented. (Author abstract)##

00912

D. F. Bender, E. Sawicki, and R. R. Wilson, Jr.

FLUORESCENT DETECTION AND SPECTROPHOTOFLUOROMETRIC CHARACTERIZATION AND ESTIMATION OF CARBAZOLES AND POLYNUCLEAR CARBAZOLES SEPARATED BY THIN-LAYER CHROMATOGRAPHY. Anal. Chem., 36(5):1011-1017, May 1964.

A modification of the solvent medium used in a previous method for carbazole has resulted in considerable stabilization of the carbazole anion. It has improved the earlier spectrophotometric, spectrophotofluorometric, and fluorescent spot test techniques for carbazoles containing acidic hydrogen on the nitrogen. The improved spectral methods have been applied to carbazoles of

higher molecular weight, including polynuclear carbazoles. The fluorescent spot test has been applied to these carbazoles adsorbed on thin-layer chromatographic substrates. The absorption and fluorescent spectra in N,N-di-methylformamide and N,N-dimethylformamide-2% methanolic tetraethylammonium hydroxide (5 to 1), the fluorescent color changes, and the identification limits are reported for carbazoles and polynuclear carbazoles. A number of thin-layer chromatographic systems are described, whereby carbazoles can be separated from other types of compounds and from one another. Commercially pure chrysene is separated readily by thin-layer chromatography into 5H-benzo(b)carbazole and chrysene. (Author abstract)##

00926

E. Sawicki, H. Johnson, and R. Rusinski

CHROMATOGRAPHIC SEPARATION AND SPECTRAL ANALYSIS OF POLYNUCLEAR AROMATIC AMINES AND HETEROCYCLIC IMINES. Microchem. J. Symp. Ser., 1(1-4):72-102, Jan. 1966. (Presented at the International Symposium on Microchemical Techniques--1965, Pennsylvania State Univ., University Park, Aug. 22-27, 1965.)

Many polynuclear aromatic amines are carcinogenic. Consequently, methods of separation and analysis for these compounds have been developed. The separation methods include the use of column and thin-layer chromatography. Various methods of characterization for approximately 45 polynuclear aromatic amines and heterocyclic imines on the thin-layer plate and in solution have been compared. The absorption and fluorescence spectra of aromatic amines and their cationic and anionic salts have been discussed. The use of direct fluorometric examination of thin-layer plates for aromatic amines was useful in the nanogram to microgram range. Quenching techniques were shown to make the fluorometric analysis of aromatic amines and heterocyclic imines much more selective. (Author summary)##

00927

E. Sawicki and T. W. Stanley

A SENSITIVE NEW PROCEDURE FOR THE ANALYSIS OF ALIPHATIC, AROMATIC AND HETEROCYCLIC ALDEHYDES. APPLICATION TO AIR POLLUTION. Preprint, 1958.

A new sensitive spot test for aliphatic, aromatic and heterocyclic aldehydes is introduced. Limits of identification for over 70 aldehydes are recorded. All aldehydes except chloral and hexadecanal give positive results in the tests. A positive test is revealed by a blue or a green color with wave length maxima ranging around 610 to 630 mu. For the determination of total aldehydes the procedure is at best an estimation. (Author summary)##

00928

E. Sawicki

IDENTIFICATION AND DETERMINATION OF UNUSUAL FUNCTIONAL GROUPS. Pure Appl. Chem., 10,101-23, 1965. (Presented at a meeting of International Union of Pure and Applied Chemistry, Pennsylvania State Univ.) 1965.

Functional group methods of analysis with sensitivities in the nanogram to microgram region are described for the following types of compounds: aromatic compounds more basic than benzene and with the highest electron density at an unsubstituted aromatic carbon atom, azulenes with an unsubstituted 1-position, compounds with a cyclopentadiene CH_2 grouping by itself or as part of a polynuclear ring system, compounds containing a fluoranthenic ring system, pyrene and its derivatives, pyridine and its derivatives, polynuclear aza heterocyclic compounds, various types of aromatic amines, heterocyclic imines, 3-indolylmethylene compounds, heterocyclic imines containing the $-NH-CH_2-CH_2-$ grouping, quinones of various types, p-hydroxyphenyl compounds, formic acid and formates, and acylating agents. In addition, quenchofluorometric methods and quenching reagents of value in thin-layer chromatography are considered. (Author summary)##

00931

E. Sawicki, S. P. McPherson, T. W. Stanley, J. Meeker, and W. C. Elbert

QUANTITATIVE COMPOSITION OF THE URBAN ATMOSPHERE IN TERMS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS AND ALIPHATIC AND POLYNUCLEAR AROMATIC HYDROCARBONS. Intern. J. Air Water Pollution, Vol. 9:515-529, 1965. (Presented at the Air Pollution Symposium, 149th American Chemical Society Meeting, Detroit, Mich. Apr. 5-9, 1965.)

Nineteen polynuclear aza heterocyclic compounds have been found in the Nashville atmosphere. Of these compounds dibenz(a,h)acridine, dibenz(a,j)acridine, and possibly some of the alkylated derivatives of dibenz(a,j)acridine and benz(c)acridine are known carcinogens. Because of this finding, a quantitative study has been made of the atmospheres of six large American cities in terms of polynuclear aza heterocyclic compounds and polynuclear aromatic hydrocarbons. In addition, the quantitative composition of a composite sample (consisting of the yearly accumulation of airborne particulates from over 100 American communities) has been determined in terms of long-chain aliphatic hydrocarbons, polynuclear aza heterocyclic compounds, and polynuclear aromatic hydrocarbons. (Author abstract)##

00934

E. Sawicki, T. W. Stanley, W. C. Elbert, and R. Morgan

COLUMN AND THIN-LAYER CHROMATOGRAPHIC SEPARATION OF POLYNUCLEAR RING-CARBONYL COMPOUNDS. Talanta, Vol. 12:605-616, 1965.

Methods for the separation of polynuclear ring-carbonyl compounds by alumina column chromatography and alumina and cellulose thin-layer chromatography are described. A method for the thin-layer chromatographic separation of acridones and phenanthridones from other types of polynuclear compound is also described. Compounds on a thin-layer chromatogram are located by fluorescence methods employing trifluoroacetic acid fumes and tetra-ethylammonium hydroxide solution. Fluorescence spectra of these compounds on the thin-layer chromatogram and in solution are also reported. (Author summary)##

00942

R. F. Adams

IMPROVED SULFUR-REACTING MICROCOULOMETRIC CELL FOR GAS CHROMATOGRAPHY. Anal. Chem., 38(8):1096-1098, July 1966. (Presented at the Air Pollution Symposium, 150th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1965.)

Because of the differences in electron requirements for oxidation of H_2S, SO_2, mercaptans, and organic sulfides and disulfides, it is necessary to standardize the titration cell against each type of compound or calculate the electron equivalents for each oxidation reaction for quantitative gas chromatographic analysis. To increase the sulfur specificity and to eliminate the need for individual compound calibration, the column effluents may be either oxidized to SO_2 or reduced to H_2S in a suitable furnace prior to introduction into the microcoulometric titration cell to obtain an equivalent response for an equivalent number of sulfur atoms. The furnace oxidation prior to titration should also destroy any olefinic compounds which might be present in complex gas mixtures, be titrated by bromine, and be erroneously reported as sulfur. Reduction to H_2S rather than oxidation to SO_2 has the added advantage of providing a four-fold increase in sensitivity because of the greater electron change required for the bromine oxidation of H_2S. Although the need for individual calibration for each compound favors the use of a furnace between the chromatography column and the detector, it complicates the analytical system and thus may not be suitable for process control analysis under all conditions. (Author summary)##

00966

S. S. Epstein

TWO SENSITIVE TESTS FOR CARCINOGENS IN THE AIR. J. Air Pollution Control Assoc., 16, (10):565-6, Oct. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-19.)

This report describes briefly 2 new bioassays, the photodynamic and mouse neonate, which have been developed recently as indirect and direct measures, respectively, of the carcinogenicity of organic atmospheric pollutants. The photodynamic assay measures concentrations of photosensitizing polycyclic compounds in organic extracts of atmospheric particulates, and reflects the ability of

these compounds to sensitize cells to the otherwise non-toxic effects of long-wave ultraviolet light. The relevance of this assay to carcinogenicity depends on the previous demonstration, in a large series of polycyclic compounds of a strong positive association between photodynamic toxicity, using the motile ciliate Paramecium caudatus, and carcinogenicity attributable to polycyclic compounds. The use of neonatal animals for the carcinogenicity testing of pure chemicals is well documented. Neonates have been shown to be highly sensitive to defined carcinogens, administration of which in very low concentrations, in general, results in high tumor yields with relatively short latency periods. The present studies, although primarily methodological, established the high sensitivity of neonatal mice to carcinogens extracted from air.##

00977

R.S. Yunghans W.A. Munroe

CONTINUOUS MONITORING OF AMBIENT ATMOSPHERES WITH THE TECHNICON AUTOANALYZER. In: Automation in Analytical Chemistry, 6pp. (Presented at the Technicon Symposium, "Automation in Analytical Chemistry," New York City, Sept. 8, 1965.)

A variety of air contaminants can be monitored continuously with Auto/Analyzers. Instrument sensitivity, precision, and response time are more than adequate. The basic modules are all interchangeable, the instrument does not become obsolete as chemical procedures change or are modified, new approaches can be programmed easily, and the equipment is useful in methods research. In addition, automatic baseline programming and restandardization are decidedly advantageous as is the capability for introducing liquid calibration standards at any time.##

00998

F. Sawicki, T.W. Stanley, J.D. Pfaff, W.C. Elbert

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND ANALYSIS OF POLYNUCLEAR AZA HETEROCYCLIC COMPOUNDS. Anal. Chim. Acta, Vol. 31:359-75, 1964.

Many thin-layer chromatographic systems can be used for the general separation of aza heterocyclic compounds from polynuclear aromatic hydrocarbons. Several can be used for the separation of the aza compounds from each other. With alumina as the adsorbent the sterically hindered aza heterocyclic compounds can be readily separated from the non-hindered aza compounds. The use of the trifluoro-acetic acid spot test on the thin-layer plate is discussed. Spectral data for the aza compounds are presented and discussed. (Author summary)##

01021

R. Buchwald

ACTIVATED SILICA GEL AS AN ADSORBENT FOR ATMOSPHERIC CONTAMINANTS. Occupational Health Rev. (Ottawa) Vol. 17(3):19-18, 1965.

The use of activated silica gel as an adsorbent for atmospheric contaminants is reviewed. The basic principles influencing the adsorption of substances on silica gel are discussed. The advantages and disadvantages in the use of silica gel are highlighted by some studies on the adsorption of such common solvents as acetone, aromatic hydrocarbons and some halogenated hydrocarbons. (Author abstract)##

01178

I. H. Williams

GAS CHROMATOGRAPHIC TECHNIQUES FOR THE IDENTIFICATION OF LOW CONCENTRATIONS OF ATMOSPHERIC POLLUTANTS . Anal. Chem. 37, (13) 1723-32, Dec. 1965.

Methods have been developed for collecting low concentrations of volatile organic compounds from the atmosphere and qualitatively analyzing them by gas chromatographic and related techniques. An inert substrate at -80C is used as a collecting agent while subtractive techniques, two different types of detectors and retention times on two columns of differing polarity are used in identifying the collected compounds. Over thirty organic compounds have been identified. These include a large number of paraffins, some aromatics, particularly benzene and toluene, some chlorinated hydrocarbons and on a few occasions ethyl nitrate and methyl disulfide. The pattern of compounds present has varied very little over the period studied, though concentrations have varied by a factor of twenty or more. (Author abstract)##

01205

D. Truitt and J. W. Robinson

RESEARCH ON NEW TECHNIQUES IN ABSORPTION AND EMISSION SPECTROSCOPY (QUARTERLY PROGRESS REPT.). Louisiana State Univ., Baton Rouge, Jan 25, 1966. 17 pp.
DDC: AD 479-281

A demountable hollow cathode was designed and constructed. The signal was erratic and electrical shorting across the electrodes took place. The cathode was modified and tested. The emission spectra of aluminum, copper, helium, fused ammonium dihydrogen phosphate and naphthalene has been recorded. The (NH4 H2PO4 (in helium) gave emission lines characteristic of al minum, PO and NH. Emission from metallic elements in sealed hollow cathodes can be greatly intensified with an electron beam. Initial experiments with molecules indicate that electrons can be transported from one electrode to another without causing emission. (Author abstract)##

01208

E. R. Stephens and F. R. Burleson

ANALYSIS OF THE ATMOSPHERE FOR LIGHT HYDROCARBONS. J. Air Pollution Control Assoc. 17, (3) 147-53, Mar. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-108.)

A procedure has been developed for the analysis of trace quantities of light hydrocarbons in air. A freeze-trap filled with chromatographic packing was installed in place of the gas sample loop of a flame ionization chromatograph. An air sample of 0.1 to 0.5 liter volume was passed through the trap which was chilled with liquid oxygen. The trap was then brought to ice temperature and its contents simultaneously swept into the column. The resulting chromatograph could be used to determine about twenty-five hydrocarbons through n-hexane. The minimum detectable concentration was below one ppb for these hydrocarbons. With such sensitivity it is possible to make useful measurements even on samples of light air pollution. Air samples from the Riverside area were analyzed in this fashion starting in the summer of 1965. The relative amounts of these hydrocarbons were then compared with the distribution reported for the various known hydrocarbon sources. The attenuation of the more reactive hydrocarbons by photolysis was also observed. A system for irradiating trapped air samples was also constructed. Samples were collected in five gallon borosilicate bottles which were then irradiated with ultraviolet radiation and the concentration changes followed. (Author abstract) ##

01225

E. E. Jacobs

RAPID GAS CHROMATOGRAPHIC DETERMINATION OF C1 TO C10 HYDROCARBONS IN AUTOMOTIVE EXHAUST GAS. Anal. Chem. 38, (1) 91-8, Jan. 1966. (Presented at the 149th Meeting, Division of Water, Air and Waste Chemistry, Detroit, Mich., Apr. 1965.)

A gas chromatographic procedure is described for the rapid determination of C1 to C10 hydrocarbons in automotive exhaust gas. The method features the application of a programmed temperature run from -55 C. to plus 180 C. with a single open tubular column and flame ionization detector. As many as 85 C1 to C10 paraffins, olefins and aromatic hydrocarbons may be determined within 13 minutes. Automatic integration of the flame detector signal is used to provide instantaneous quantitative analysis for as little as 1 ppm (v./v.) of each hydrocarbon. The equipment and operating conditions of the chromatographic method are discussed and an analysis of exhaust gas is illustrated. (Author abstract) ##

01230

R. L. Bouisques

SIMULTANEOUS DETERMINATION OF LEAD ALKYLS AND HALIDE SCAVENGERS IN GASOLINE BY GAS CHROMATOGRAPHY WITH FLAME IONIZATION DETECTION . Anal. Chem. 38, (1) 28-33, Jan. 1966.

A gas chromatographic method with flame ionization detection for the determination of lead alkyls and scavengers in gasoline is described. These compounds are separated in a partition column and hydrogenated using a nickel catalyst, and the resulting methane and/or ethane is separated from gasoline hydrocarbons on an absorption column. The equipment employed and its application to the continuous analysis of leaded gasolines are discussed. The reliability of results and the lack of interferences are verified with both laboratory-prepared and commercial samples. (Author abstract)##

01231

F. Kawicki, T. W. Stanley, and W. C. Elbert

DIRECT FLUOROMETRIC SCANNING OF THIN LAYER CHROMATOGRAMS AND ITS APPLICATION TO AIR POLLUTION STUDIES . J. Chromatog. 20, 348-51, 1965.

A direct method is presented for automatic fluorometric scanning of thin-layer chromatograms with much greater selectivity and sensitivity than has hitherto been possible. By use of the proper excitation and emission spectral bands, a chromatogram can be examined for an individual compound or for a family of compounds. In addition, quenched-fluorometric techniques applied to the thin-layer plate eliminate many interferences and further improve the sensitivity.##

01232

L. DeMaio and H. Corn

GAS CHROMATOGRAPHIC ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS WITH PACKED COLUMN (APPLICATION TO AIR POLLUTION STUDIES). Anal. Chem. 38, (1) 131-3, Jan. 1966.

A method utilizing gas chromatography for the analysis of polynuclear aromatic hydrocarbons has been suggested for general use. The method was developed for use in analyzing polycyclic hydrocarbons associated with particulate matter in the air; however, it can be used wherever it is required to analyze for polynuclear aromatic hydrocarbons. The primary advantages of this method when compared to the methods now used are the ease of performance and time differential. One man can easily complete the analysis in two hours after the sample is extracted from the filter. Previously, several analysts required two days to complete the procedures.##

01269

F. D. Fleming, B. Dimitriades, and R. W. Hum

PROCEDURES IN SAMPLING AND HANDLING AUTO EXHAUST. J. Air

Both the composition and discharge rate of auto exhausts vary widely and rapidly as speed and load demands upon the engine are changed. Moreover, among the combustion products are compounds that are highly reactive under proper conditions and others that are readily bound by receptive surfaces or absorbents. Under these conditions both the sampling procedure and subsequent sample handling must be such that (1) the sample that is recovered contains all or a fixed proportion of each incremental volume of the total to be represented and (2) the products so sampled are not allowed either to react with each other or to be lost or diminished in sample storage or transfer. Experimental research and development relevant to each requirement have been carried out, and results are reported and discussed. Two methods have been used for recovering small-volume samples representative of the total volume produced during any combination of steady or transient engine modes. One employs a servo-followup system appropriately coupled to both the engine air-intake and to the sampling element; the sampling rate is continuously controlled to bear at all times a fixed ratio to the engine air-intake rate. The second method employs variable dilution, involving addition of diluent gas necessary to maintain a constant total of (exhaust plus diluent). If the mixture is sampled at a constant rate, the sample will contain exhaust appropriately proportioned. Experiments have shown differences in both hydrocarbon and NOx values determined for comparable samples obtained by the two methods. The seriousness of this problem is discussed in relation to the sampling and sample handling procedures that are used. (Author abstract)**

01270

R. Grob

GAS CHROMATOGRAPHY OF CIGARETTE SMOKE, PART III. SEPARATION OF THE OVERLAP REGION OF GAS AND PARTICULATE PHASE BY CAPILLARY COLUMNS. J. Gas Chromatog, 3, 52-6, Feb, 1965. (Presented in part at Tobacco Chemists' Research Conference, Raleigh, N.C., Oct. 22, 1964.)

Following the investigation of gas phase constituents boiling within the range of 20-100C, the section of less volatile substances with boiling points between 100 and 200C has been studied. The separation by capillary columns is demonstrated, and 69 substances are indicated as probable gas phase constituents. The partition of certain substances between gas phase and particulate phase is shown to be of great importance. Some influences upon the partition equilibrium, for instance charcoal filters, are discussed. (Author abstract)**

01289

R. Feldstein, S. Balestrieri, and D. A. Levaggi

STUDIES ON THE GAS CHROMATOGRAPHIC DETERMINATION OF MERCAPTANS. J. Air Pollution Control Assoc. 15(5):215-7, May 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

A series of partitioning agents were studied to determine their ability to separate organic sulfur compounds by gas chromatography. Several columns showed promise, but did not separate organic sulfur compounds from normally occurring atmospheric hydrocarbons. Higher concentrations of organic sulfur compounds in stack gases are separated as metallic salts in a series of impingers. The nature of the precipitated sulfur compound can be determined by gas chromatography after regeneration of the compound by addition of acid to the metallic precipitate. (Author abstract)##

01302

S.S. Epstein, H. Small, E. Bawicki, H.L. Falk

PHOTODYNAMIC BIOASSAY OF POLYCYCLIC ATMOSPHERIC POLLUTANTS. J. Air Pollution Control Assoc., Vol. 15(9):174-176, April 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

A photodynamic bioassay which can be conducted on one mgm amounts of organic atmospheric particulates is described. The results of a pilot study on pollutants from several American cities indicate that the assay may provide a rapid, simple and economical biological index of potential carcinogenic hazard attributable to polycyclic compounds. The utility of the assay for this purpose is under further evaluation. (Author abstract)##

01304

W.B. Barlage, Jr. F.C. Alley

SAMPLING AND MASS SPECTROMETER ANALYSIS OF REACTION PRODUCTS FROM THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS. J. Air Pollution Control Assoc., 15(5):235-238, May 1965.

Results of this investigation have shown the sampling technique described in this paper to have potential for mass spectrometer analysis of trace products from the photochemical decomposition of olefins. In addition, preliminary results of this investigation using 1-pentene and 1-hexene as reactants, along with nitrogen dioxide in air mixtures, have shown the presence of compounds or ion fragments of compounds with molecular masses as high as 166 and possibly higher. More work is needed to determine if these compounds are indeed peroxyacyl nitrites or nitrates, "compound X," or perhaps some type of a polymer produced in the photochemical reactions.##

01110

E.A. Doettner F.C. Dalton

ANALYSIS OF AIR AND BREATH FOR CHLORINATED HYDROCARBONS BY INFRARED AND GAS CHROMATOGRAPHIC TECHNIQUES. Am. Ind. Hyg. Assoc. J. Vol. 26:289-293, June 1965. (Presented at the Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., April 28, 1965.)

This paper is a report of an investigation establishing the sensitivity of gas chromatography and infrared techniques for the chlorinated aliphatic hydrocarbons listed in the booklet "Threshold Limit Values for 1961." The gas chromatographic measurements include those made with the following detection methods: thermal conductivity, flame ionization, argon ionization, and electron capture. The infrared work was done with the aid of scale expansion techniques and multipass cells up to 40 meters in length. The analytical technique used and the sensitivities attained in the analysis of air and exhaled breath are presented. (Author abstract)##

01111

A. T. Ping, L. R. Clayton, T. W. McEwen, and J. S. Paydo

THE APPLICATION OF SILICA GEL IN SOURCE TESTING. PART I: COLLECTION OF SAMPLES. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-79.)

The engineering of air pollution control deals with testing gas effluents for air contaminants and their concentrations. In this endeavor, the Bay Area Air Pollution Control District has developed and improved a technique of using silica gel adsorption tubes for determining test data on the organic compound emissions from commercial and industrial operations. This paper discusses a phase of source testing for such gaseous emissions from solvent-user operations. General details, involving the sample probe, sampling train, and pressure drops are included in the paper. Some typical test data and calculations are also given. (Author abstract)##

01156

C.W. Louw

THE QUANTITATIVE DETERMINATION OF BENZO(A)PYRENE IN THE AIR OF SOUTH AFRICAN CITIES. Am. Ind. Hyg. Assoc. J., Vol. 26:520-526, Oct. 1965.

The atmospheres of three South African cities have been investigated for the presence of polynuclear hydrocarbons. Standard techniques were improved and applied for separation of benzo(a)pyrene from other polynuclear hydrocarbons. Ultraviolet-visible spectrophotometry at the 402 m microm peak was employed for quantitative determination of benzo(a)pyrene. A correction factor for the interference of benzo(k)fluoranthene

at the 402 a micron peak was determined experimentally and applied to the results. It is believed that this method is more reliable than those presently used. Some benzo(a)pyrene concentrations are presented. (Author abstract)##

01192

C.L. Fraust, E.R. Hermann

CHARCOAL SAMPLING TUBES FOR ORGANIC VAPOR ANALYSIS BY GAS CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J., 27(1):68-70, Feb. 1966.

Variation in efficiency of recovery of organic vapors collected on activated charcoal and desorbed into carbon disulfide, was studied with respect to certain parameters of the process. Chemicals used were methylethyl ketone, toluene, trichloroethylene, butyl acetate, 2-methylcyclohexanol, and styrene. Analyses were performed with a gas chromatograph. The effects of charcoal mesh size, sampling rate, volume collected, and vapor concentration were considered. Mesh sizes of carbon granules studied were 10/20, 20/30, 30/50, and 40/50. Also, a special vapro adsorption charcoal, 60/80 mesh was used. Effects of sampling rate were determined over a 100 ml/min range. From 0.5 to 1.5 liters of sample were collected for experiments dealing with volume collected. In studying the effect of carrying concentration, a range of 1 TLV to 5 TLV was employed. (Author abstract)##

01195

N. Tye, A.W. Horton, I. Napier

BENZO(A)PYRENE AND OTHER AROMATIC HYDROCARBONS EXTRACTABLE FROM BITUMINOUS COAL. Am. Ind. Hyg. Assoc. J., Vol. 27:25-28, Feb. 1966.

Benzo(a)pyrene, benz(a)anthracene, and other polycyclic aromatic hydrocarbons have been shown to be present in bituminous coal. Extraction with toluene, chromatography on alumina, the Diels-Alder reaction, solubility in concentrated sulfuric acid, and catalytic iodination or alumina were coupled with ultraviolet spectrophotometry and mass spectrometry to obtain quantitative estimates of these compounds in the extracts. (Author abstract)##

01419

A. Turk, J. I. Mosrow, S. H. Steidl, and W. Haucht

ENHANCED DESORPTION OF ATMOSPHERIC SAMPLES FROM ACTIVATED CARBON. J. Air Pollution Control Assoc. 16(7):383-385, July 1966. (Preliminary portion of this work was presented before the Division of Water and Waste Chemistry, 150th Meeting, American Chemical Society.)

It has been previously shown that the desorption of either a chemisorbed or a physically adsorbed gas can be enhanced by the

subsequent introduction of a foreign gas. Under conditions in which desorption recovery of butane from activated carbon was 50 to 65%, subsequent adsorption of CCl_4 enhanced the recovery of butane to 100%. Recovery of CCl_2F_2, originally 79%, was enhanced to 99% by the same method. The method of enhanced desorption was applied to the recovery of samples from activated carbons exposed to atmospheres in Chicago, New Orleans, Philadelphia, Washington, D. C., and Cincinnati. Three different types of carbons, characterized by different distributions of pore diameters, were used simultaneously in the Cincinnati sampling. In general, the enhanced desorption technique was advantageous in providing analytical information on adsorbed samples recovered from carbon media. The enhancement effect is especially marked with hydrocarbon material. The effects of these structural attributes of the carbon media are evaluated by detailed consideration of infrared adsorptions. (Author abstract)##

01430

V. H. Ruehner, H. G. Eaton, and J. H. Chaudet

A GAS CHROMATOGRAPH FOR THE APOLLO SPACECRAFT (PRELIMINARY REPT.) J. Gas Chromatog., Vol. 4:121-125, April 1966.

Gas chromatographic columns and detectors suitable for monitoring the atmosphere within a space vehicle are described. Molecular sieve, liquid coated Teflon, and liquid coated Chromosorb columns were developed to achieve a high degree of separation and freedom from adsorption for the most likely atmospheric contaminants. Miniature cross-section ionization detectors have been designed to provide better than 10 ppm sensitivity for most of these contaminants. The chromatographic system has been designed to operate at a flow rate of only 12 ml/min, thus assuring a long operational time from a small gas container. (Author summary modified)##

01451

R. J. Prager

DETECTION OF 1,1-DIMETHYLHYDRAZINE BY FRUSTRATED MULTIPLE INTERNAL REFLECTION SPECTROSCOPY. Am. Ind. Hyg. Assoc. J., Vol. 27:272-277, June 1966.

The detection of vapors, especially of the missile propellant fuel, 1,1-dimethylhydrazine, by frustrated multiple internal reflection (FMIR) spectroscopy was studied. This method is most sensitive to substances with high boiling points; however, it can be used to detect microgram quantities of substances with relatively low boiling points by coating the FMIR plate with a thin adsorptive film or by dissolving the samples in a suitable solvent. (Author abstract)##

01461

A. J. Chiantella, W. D. Smith, R. E. Eastead, and J. E. Johnson

AROMATIC HYDROCARBONS IN NUCLEAR SUBMARINE ATMOSPHERES. Am. Ind. Hyg. Assoc. J., Vol. 27:186-192, Apr. 1966.

An analytical study has been directed to the identification and determination of individual aromatic hydrocarbons present in nuclear submarine atmospheres in concentrations of parts per million or less. Hydrocarbon oil samples were desorbed from activated carbon which had been exposed in submarine atmospheres. The aromatic hydrocarbon content of these oils was approximately 25 to 30% of the total. The quantitative distributions of individual aromatic hydrocarbons found in submarines were strikingly similar to those of typical petroleum distillates in the same boiling range. Several commercial products were studied as possible sources of hydrocarbons in submarine atmospheres. (Author abstract)##

01695

A. A. Strong and J. F. Horton

THE INSTRUMENTATION FOR AUTOMATIC MEASUREMENT AND RECORDING OF LABORATORY-PRODUCED AUTOMOBILE EXHAUST. Preprint. 1966.

A system that automatically measures and records the concentration of six different gases from twelve animal exposure chambers supplied with diluted, laboratory-produced automobile exhaust and other gases is described. The gases are sequentially fed from the animal exposure chambers to the appropriate gas analyzing instrument. Multipoint recorders connected to the output of the gas instruments register the concentrations and control the sequence of the gas measurements. A data acquisition system is also connected to the output of of the gas instruments to record on a punched paper tape the time of measurement and the gas concentration. The data are punched on cards or inserted directly into a digital computer for analysis. (Author abstract)##

01696

R. E. Campbell and H. B. Ide

AIR SAMPLING AND ANALYSIS WITH MICROCOLUMNS OF SILICA GEL. Am. Ind. Hyg. Assoc. J. 27, (4) 323-31, Aug. 1966.

This paper describes a simple microcolumn of silica gel, its behavior under experimental conditions and its applicability to air sampling. Data are presented for the ultraviolet spectral absorbance analysis of selected aromatic hydrocarbons, using a base line correction for background interference. The problems of direct silica gel elution and ultraviolet spectrophotometry are discussed, and resolution of the particulate background problem by base line calculations is shown. The silica gel microcolumn is proved simple, practical, and highly efficient for sampling air contaminants. Although only spectrophotometric analysis of eluates is reported here, other methods of analyzing the sorbed contaminant are suggested. (Author abstract)##

01503

L. E. Green, D. F. Albert, and H. H. Barber

A SEMI-AUTOMATIC GAS CHROMATOGRAPH FOR DETERMINING N-PARAFFINS AND HYDROCARBON TYPES IN GASOLINES. J. Gas Chromatog., 4(9):319-321, Sept. 1966.

A gas chromatographic method for determining aromatics, naturates, and olefins in gasolines recently was extended to include individual C5 to C11 n-paraffins. Three optional analyses with the instrument are described. To determine the accuracy and precision of the semi-automatic method, 6 samples were analyzed and the results compared with those obtained by the FIA method. The instrument is adaptable to routine use and is applicable to samples other than gasolines, and has recently been adapted to the determination of hydrocarbon types in exhaust gases.##

01560

C. J. Doske, D. J. Lindley, and C. H. Bechtel

HOW TO STUDY EFFECT OF BLOWBY GAS. Hydrocarbon Process 45(9):103-106, Sept. 1966.

The character and chemical composition of blowby gases were studied by ducting them from an engine modified with Teflon parts and fractionating them in a series of traps at 32, -100, and -320 F. The fractions were analyzed by infrared absorption, mass spectrometry, and gas chromatography. The hydrocarbons portion of the blowby gas was roughly 50% aromatics, 35% naturates, and 15% olefins. The combined concentration of oxygenated organic compounds present in the blowby gas was found to be less than five parts per million. The analytical data showed that changing air-fuel ratio had little or no effect on the composition of the hydrocarbons being emitted from the crankcase.##

01581

E.H. Barber

IDENTIFICATION OF AROMATIC COMPOUNDS AS SIMPLE AZINES BY PAPER AND THIN-LAYER CHROMATOGRAPHY. J. Chromatog., Vol. 27:398-405, 1967.

A method is described for the separation of carbonyls as simple azines by paper and thin-layer chromatography. Schleicher and Schuell 2040 a gl. papers were used in paper chromatography. Extensive data are given for separations on papers impregnated with N,N-dimethylformamide in (1) N,N-dimethylformamide-cyclohexane; (2) dibutyl ether-tetrahydrofuran - N, N-dimethylformamide; (3) cyclohexane - N,N-dimethylformamide - carbon tetrachloride; (4) cyclohexane - N,N-dimethylformamide - ethylacetate - water and (5) decalin - N,N-dimethylformamide. Separations were also performed on papers impregnated with methylformanilide in cyclohexane-formanilide. Thin-layer separations were performed on silica gel in benzene; ethyl acetate - hexane; benzene - paraffin - acetic acid-water; dibutyl ether tetrahydrofuran; dichloromethane; and decalin - dichloromethane -

methanol. An example of the thin-layer separation of an automobile exhaust sample is given. (Author abstract)##

01592

F.S. Ludwig, D.R. Coulson, E. Robinson, L.A. Cavanagh

SIZE DETERMINATION OF ATMOSPHERIC SULFATE AND ORGANIC PARTICULATES (-INTERIM REPT.). Stanford Research Inst., Menlo Park, Calif. Dec. 1964. 78 pp.

Methods of determining size distributions of sulfate and organic aerosols have been developed and tested in the San Francisco and Los Angeles areas. The methods show promise of providing size distribution information which could significantly add to the understanding of some current public health problems. The heart of the sample collection system is a Goetz Aerosol Spectrometer, which has been modified to prevent loss of sample or entrainment of contaminated air and to allow collection of the particles which are not deposited in the spectrometer itself. Enough data have been collected to prove the feasibility of the methods developed. Furthermore, these initial data provide a preliminary estimate of size distributions of the sulfate and organic aerosols in the tested areas. The Appendix contains discussions of the calculation of size distribution and effect of temperature and humidity on sulfuric acid droplet size.##

01593

METHODS OF MEASURING AIR POLLUTION (-REPORT OF THE WORKING PARTY ON METHODS OF MEASURING AIR POLLUTION AND SURVEY TECHNIQUES). Organization and Development, Paris, France, Directorate for Scientific Affairs. 1965. 94 pp.

Methods for the measurement of the amounts of the following pollutants in the atmosphere out of doors using relatively simple and inexpensive apparatus were examined: grit and dust - particles coarse enough to settle out under their own weight; suspended matter - particles or droplets fine enough to remain suspended in the air; sulphur oxides; hydrocarbons; and fluorine compounds.##

01594

R. Klein, W.E. Hobbert, E. Stair, R.G. Tipson

AIR POLLUTION PROGRAM, NATIONAL BUREAU OF STANDARDS (QUARTERLY REPT. OCT. 1, 1965 TO DEC. 31, 1965.) National Bureau of Standards, Washington, D.C., Divisions of Analytical Chemistry, Metrology, and Physical Chemistry (Rept. No. 9011). (Mas with PHS support) 1965.

Progress is reported on: the purification of naphthacene; anthraquinone derivatives; oxidation products of pyrene; oxidation products of perylene; photochemical reaction on the solid particulates anthracene and pyrene; photochemical reactions of

pyrene on Maryland soil; photochemical reactions of pyrene on silica gel-alumina; photosensitized decomposition of 3-methylpentanal; surface chemistry; and solar radiation.##

01691

I.R. Cohen T.C. Purcell

SPECTROPHOTOMETRIC DETERMINATION OF HYDROGEN PEROXIDE WITH 8-QUINOLINOL. Preprint, 1966.

A method is reported for the spectrophotometric determination of microgram quantities of hydrogen peroxide. The analytical procedure makes use of the colored complex obtained upon extraction of titanium-hydrogen peroxide mixtures with a 0.1% solution of 8-quinolinol in chloroform. The method is very specific and more sensitive than that which uses the color given by titanium and hydrogen peroxide alone. The optimum procedural conditions were selected with regard for the effect of temperature, pH, rate of color formation, stability of complex, and the like. Application of the method for the analysis of vapor concentrations is also discussed. (Author abstract)##

01696

R. Johnson, E. Sawicki

SPECTRAL CHARACTERIZATION OF NITROARENES AND POLYCYCLIC ALDEHYDES, KETONES, QUINONES, AND AMINES. Talanta 13, 1361-73, 1966.

Three methods are introduced for the post-chromatographic spectral characterization of carbonyl and nitro compounds. Most often, elution from the chromatogram is necessary, but sometimes fluorescence spectra can be obtained directly from the chromatogram. The usefulness and sensitivity of the methods have been demonstrated for a variety of nitroarenes and polycyclic aldehydes, ketones, quinones, and amines. (Author abstract)##

01710

W. Kutscher and R. Tosingas

INVESTIGATING SOOT AND ATMOSPHERIC DUST IN THE MANNHEIM AREA. STAUB (English Transl.) 26, (6) 5-10, June 1966.

The benzpyrene content of different types of soot was determined quantitatively. Soot from coke firing is practically free from benzpyrene. Soot from oil firing exhibits considerable variations in its chemical composition and benzpyrene content. Soot from hard coal firing has the highest benzpyrene content. In addition, dust collected in a filter plant at a level of 49 m was also investigated. The largest part of benzpyrene is bound to the finest coal particles which penetrate to the deepest alveolar chambers of the lungs. More than 70% of the dust is comparatively free from benzpyrene. Finally, a test is carried out to calculate the amount of dust in air and the amount of benzpyrene to which a breathing person is exposed. (Author summary)##

01720

E. D. Barber and J. P. Lodge, Jr.

PAPER CHROMATOGRAPHIC IDENTIFICATION OF CARBONYL COMPOUNDS AS THEIR 2,4-DINITROPHENYLHYDROZONES IN AUTOMOBILE EXHAUST. Anal. Chem. 35, 348-50, Mar. 1963.

A method is described for the separation and identification of carbonyl compounds in automobile exhaust by paper chromatography. Extended data are given for separations in a modified Neish phase as well as for limited separations in DeJonge's system. Although homologous aldehydes are completely separated, ketones show higher Rf values than aldehydes of the same carbon number. The results of analysis of several samples are presented. (Author abstract)##

01729

E. Sawicki, T. W. Stanley, T. R. Hauser, R. Johnson, and W. Elbert

CORRELATION OF PIPERONAL TEST VALUES FOR AROMATIC COMPOUNDS WITH THE ATMOSPHERIC CONCENTRATION OF BENZO(A)PYRENE. Intern. J. Air Water Pollution 7, 57-70, 1963.

Several general methods for the determination of aromatic compounds in polluted air are described and compared. Of these the piperonal test is most thoroughly investigated in respect to precision, color stability, and general usability. The color obtained in the procedure is in compliance with Beer's law. Over the last four years approximately 200 samples of airborne particulates have been analyzed for their piperonal test R values and their concentrations of benzo(a)pyrene. These two values show a fair but definite correlation. For some communities, the correlation is good, for a few it is poor. A broad range of values is obtained: a sample from Gulf State Park in Alabama showed a R755 value of 0.009 and a concentration of 0.076 microgram of benzo(a)pyrene per 1000 cubic meter of air; for a London sample the R755 value was 13 and the benzo(a)pyrene concentration 270 micrograms; for an incinerator stack sample the R755 value was 6900 and the benzo(a)pyrene concentration 69,000 micrograms benzpyrene per 1000 cubic meter of gas. The correlation coefficients between benzo(a)pyrene concentration in micrograms per 1000 cubic millimeter (Y), and the piperonal test R755 values (X), were 0.95 and 0.89 for 179 urban and 25 non-urban samples, respectively. The corresponding formulas are Y equal -0.52 plus 19.1X for urban samples and Y equal -0.132 plus 15.1X for non-urban samples. The piperonal test should be of value in studying combustion processes, the aromatic compound pollution in various parts of a community, and in evaluating the effluents of pollution sources. (Author abstract)##

01735

E. Sawicki, T. W. Stanley, W. C. Elbert, and J. D. Pfaff

APPLICATION OF THIN LAYER CHROMATOGRAPHY TO THE ANALYSIS OF ATMOSPHERIC POLLUTANTS AND DETERMINATION OF BENZO(A)PYRENE. Anal. Chem. 36, (3) 497-502, Mar. 1964.

Rf-values, and fluorescent colors have been obtained through thin-layer chromatography of 20 polynuclear aromatic hydrocarbons with the following absorbents and developers: alumina with pentane: ether (19:1; v./v.); cellulose acetate with ethanol:toluene:water (17:0.4; v./v.); and cellulose:cellulose with dimethylformamide:water (1:1, v./v.). Of the three absorbents, alumina gave the best separation of fluorescent organic compounds from the organic fractions of airborne and air pollution source particulates. The pattern and fluorescent color of the spots of a thin-layer chromatogram varied with the type of pollution. The cellulose acetate absorbent system gave best results for the separation of the benz-pyrene fraction obtained in column chromatography. The cellulose adsorbent system gave the best results for the separation of the polynuclear aromatic hydrocarbons. The greatest range in Rf-values was obtained with this absorbent. Two methods for the estimation of benzo(a)pyrene following thin layer chromatography are described. One method involves ultraviolet analysis at 382 millimicrons, the other method involves spectrophotofluorometric analysis in sulfuric acid. (Author abstract)##

01731

F. Sawicki, T.R. Stanley, J.D. Pfaff, W.C. Elbert

THIN-LAYER CHROMATOGRAPHIC SEPARATION OF BENZO(A)PYRENE AND BENZO(E)FLUORANTHENE FROM AIRBORNE PARTICULATES. Chemist-Analyst 53, 6-8, Jan. 1964.

By column chromatography followed by thin-layer chromatography a better separation was obtained. The latter technic is relatively simple and rapid and offers the advantage that enough material can be readily obtained for spectrophotofluorometric study and, with somewhat more difficulty, for absorption spectral studies. It has been found that using a cellulose acetate adsorbent and ethanol-toluene-water as the solvent benzo(a)pyrene and benzo(k)fluoranthene can be readily separated from each other and from other members of the "benzpyrene" fraction. (Author abstract)##

01732

D.F. Adams, F.R. Koppe, W.M. Tuttle

ANALYSIS OF KRAFT-MILL, SULFUR-CONTAINING GASES WITH GLC SORPTION. J. Air Pollution Control Assoc. 15, (1) 31-3, Jan. 1965

The technique includes the use of two chromatographic columns in series to separate O2, N2,CO,CO2, H2O, H2S, SO2, and CH3SH. Column 1, containing Triton X-45 on Chromosorb, separates H2O, H2S, SO2 and CH3SH. Column 2, packed with Molecular Sieve, separates O2, N2, CO2. The conditions required to obtain adequate sensitivity and separation are discussed. (Author abstract)##

01795

E. Sawicki, T.W. Stanley, W.C. Elbert

ANALYSIS OF THE URBAN ATMOSPHERE AND AIR POLLUTION SOURCE EFFLUENTS FOR PHENALEN-1-ONE AND 7H-BENZ(DE)ANTHRACEN-7-ONE. Mikrochim. Acta (5-6), 1110-23, 1965.

Through the use of one- and two-dessensional thin-layer chromatography and direct spectrophotofluorometric examination of thin-layer plates, two members of a new family of compounds have been found in the atmosphere. Phenalen-1-one and 7 H-Benz(de)anthracen-7-one were identified and determined in particulates obtained from urban atmospheres and air pollution source effluents. Scanning techniques and other methods of analysis were also used in characterization and estimation. Two-dimensional thin-layer chromatography followed by direct spectrophotofluorometric analysis appears to be the most promising chromatographic method for the routine analysis of chemical compounds in complex mixtures. It approaches colorimetric analysis in simplicity and speed and surpasses it in sensitivity, selectivity and the amount of information that can be obtained from one analysis. (Author summary)##

01798

H.B. Tabbens, J.F. Thomas, R. Mukai

PARTICULATE AIR POLLUTANTS RESULTING FROM COMBUSTION. Am. Soc. Testing Mater., Spec. Tech. Publ. 352. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.) pp 1-11, Dec. 1963.

An enormous variety of organic by-products result from both oxidative degradation of fuels and synthesis of complex molecular species occurring simultaneously when combustion is incomplete. Synthesis is demonstrated by the fact that polynuclear aromatic hydrocarbons with molecular weights up to 300 may be derived from incomplete combustion of such a simple fuel as methane. These hydrocarbons are part of the solid phase of combustion by-products and may be filtered from gaseous components. Among them are the arenes naphthalene, anthracene, pyrene, benzo(a)pyrene dibenz(a,h) anthracene, and others. Additionally, there exist relatively non-volatile oxidation derivatives such as alpha- and beta-naphthol and others. Only a few of the 90 or more individual chemical entities found in these series have been positively identified. Sufficient evidence exists from burning a variety of gaseous, liquid, and solid fuels to state categorically that it is the process of combustion rather than the chemical quality of the fuel which leads to synthesis of these arenes. Fuels studied include natural gas; propane; butane; 1-butene; 1,3-butadiene; ethyne, hexane; 2,2,4 trimethylpentane cyclohexane; 1-hexene; benzene; toluene; and gasoline, as well as the miscellaneous pollutions involved in incineration of paper, wood, tree trimmings, and the like. The same range of aromatic hydrocarbons has been separated from contaminated air in distressed urban atmospheres. Investigation of aldehydes produced by combustion indicated that only formaldehyde decreased with increasing secondary air when combustion was incomplete. However, with complete combustion, use of additional secondary air

was accompanied by an increasing quantity of formaldehyde. Thus using large excesses of secondary air to control smoke may be inadvisable for air-pollution control. The total amount of arenes produced depends in part on the incompleteness of the burning process. While one would assume that the smoking point of fuels would be an index of relative ease of combustion and of relative desirability of fuels for urban usage, the possible production of combustion nuclei is also suggested. Such a criterion may become significant in choosing fuels suitable for use in urban environments. (Author summary modified)**

01002

T.P. Hauser R.L. Cussino

INCREASING SENSITIVITY OF 3-METHYL-2BENZOTHIAZALONE HYDRAZONE TEST FOR ANALYSIS OF ALIPHATIC ALDEHYDES IN AIR. Anal. Chem. 36, (3) 679-81, Mar. 1964.

A modification of the (3-methyl-2-benzothiazolone hydrazone test) procedure is described in which the addition of sulfamic acid, in the oxidising step of the reaction, gives a solution free of turbidity and capable of colorimetric analysis without dilution by acetone. A reduction in the volume of the oxidising agent originally added in this step further contributes to the concentration of the color. Although a comparison of this procedure with that of Sawicki shows a loss in molar absorbance, the sensitivity of the method is increased approximately sixfold. This increased sensitivity easily permits the analysis of aliphatic aldehydes in the parts-per-billion range in ambient air.**

01017

E. Sawicki, J.E. Meeker, J. Morgan

COLUMN CHROMATOGRAPHIC SEPARATION OF BASIC POLYNUCLEAR AROMATIC COMPOUNDS FROM COMPLEX MIXTURES. J. Chromatog. 17, 232-6, 1965.

A new method for the column chromatographic separation of basic polycyclic fractions of extremely complicated mixtures is described. Heterocyclic hydrocarbons sterically hindered at the aza nitrogen atom are readily separated from non-sterically hindered aza compounds. Aza heterocyclic hydrocarbons with the same amount of steric hindrance are eluted in the order of their increasing number of fused rings per molecule. The method has been applied to the separation of the basic fraction of coal tar pitch. An alkylbenzo(h)quinoline, benzo(h)quinoline, benzo(f)quinoline, acridine, benz(a)acridine and benz(c)acridine have been identified. In addition, approximately 100 unknown compounds were believed to be present in the fractions. The evidence for this conclusion was derived from the absorption spectra. (Author summary)**

01821

G.C. Orlean

MONITORING METHANE IN ATMOSPHERE WITH A FLAME IONIZATION DETECTOR. Anal. Chem. 38, 646-8, Apr. 1966.

Complex analytical problems are involved in the study of the reactants and products of atmospheric photochemical reactions. One such problem is the determination of atmospheric hydrocarbons levels and the relation of these to emissions of hydrocarbons from vehicles and other sources. The greatest interest is in those hydrocarbons that participate in photochemical reactions. While methane is innocuous and while it does not participate in photoinitiated reactions, it does constitute a major portion (about 65%) of the total hydrocarbons present in air and nearly all of the nonreactive fraction. A rough correlation may thus be seen to exist between "reactive hydrocarbons" and "total hydrocarbons less methane." Pending the development of a type-specific method for determing reactive hydrocarbons directly, it has been found that a compound-specific method for methane has real value. The system for methane measurement operates by passing a sample air stream through a solid adsorbent which has been stripped of all hydrocarbons and then saturated with 6 to 10 p.p.m. of methane in air. The effluent from a column of air less all hydrocarbons except methane passes into a flame ionization analyzer. (Author abstract)##

01826

W. C. Eibert, and T. W. Stanley

THE FLUORESCENCE-QUENCHING EFFECT IN THIN-LAYER CHROMATOGRAPHY OF POLYNUCLEAR AROMATIC HYDROCARBONS AND THEIR AZA ANALOGS. J. Chromatog. 17, 120-6, 1965.

Fluorescence quenching effects were studied with volatile quencher in the developer, with a relatively non-volatile quencher after development. On the basis of quenching effects the aromatic compounds can be divided for analytical purposes into non-fluoranthenic aromatic, fluoranthenic and aza hydrocarbons. The latter group can be further subdivided. Two systems for the separation of polycyclic aza hydrocarbons elute according to the size of the ring system and the amount of steric hindrance at a ring nitrogen atom. Pyrenoline can be characterized by the specific violet color it forms on the plate. The various methods show promise for use in air pollution studies. (Author summary)##

01831

L. C. Brewing, Jr.

AN EVALUATION OF TECHNIQUES FOR MEASURING AIR-FUEL RATIO. Preprint. (Presented at the Annual Meeting, Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1965.)

Four methods for determining air-fuel ratio by exhaust analysis are compared. The methods selected for study are all potentially useful with analyses of integrated samples obtained in road tests

of exhaust samples generated in the laboratory. A V-8 engine mounted on an engine dynamometer was used to generate exhaust, from which the air-fuel ratios were determined simultaneously by the various methods. The air-fuel ratio of the mixture delivered to the engine was determined by measuring directly the quantities of air and fuel supplied. This value was compared to those obtained by the four exhaust analysis techniques. Comparisons were made during normal operation and during conditions of deliberate cylinder misfire to simulate the most adverse combustion condition encountered on the road. (Author abstract)**

01832

C. A. Clemons and A. P. Altshuller

RESPONSES OF ELECTRON-CAPTURE DETECTOR TO HALOGENATED SUBSTANCES. Anal. Chem. 38, (1) 133-6, Jan. 1966. (Presented before the Division of Water, Air, and Waste Chemistry, 149th Meeting, American Chemical Society, Chicago, Ill., Sept. 1965.)

Authors' investigation of the response of the electron-capture detector to halogenated hydrocarbons revealed that the responses varied over about seven orders of magnitude. Low responses are shown by saturated and vinyl-type fluorinated hydrocarbons including those containing one chlorine atom. Compounds with the chlorine atom attached to a vinyl carbon gave lower responses than the corresponding saturated compounds. Attachment of the chlorine to an allyl carbon atom resulted in greater sensitivity than that obtained for the corresponding saturated compound. The response characteristics of the fluorinated cyclobutane ring closely resembled those of compounds with allyl CF3 groups. The completely fluorinated benzene derivative, C6F6, gave a high response. As reported previously, the response decreased in the order I greater than Br greater than Cl greater than F and also increased markedly with increase in the number of Cl, Br, or I atoms in the molecule. One iodine atom in a molecule caused about the same response in the same range as two bromine atoms or three chlorine atoms. Responses in molecules of different structures containing the same number of halogen atoms varied by one to two orders of magnitude.**

01971

CONTINUOUS AIR MONITORING PROGRAM IN WASHINGTON, D.C. (1962-1963). Public Health Service, Cincinnati, Ohio, Div. OF AIR POLLUTION. SEPT. 1966. 222 PP.
NEW: 999-AP-23; GPO: 827-214-15

This report presents the results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Washington, D.C., during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, oxides of nitrogen, total oxidants, total hydrocarbons, and carbon monoxide are summarized, analyzed, and discussed. The data are tabulated as hourly, daily, and monthly mean concentrations; background information about Washington and a description of the instrumentation used are included. (Author abstract)**

01876

Schuette, F. J.

PLASTIC BAGS FOR COLLECTION OF GAS SAMPLES. California Dept. of Public Health, Berkeley, Div. of Labs.; AIHL-19, 6p., Dec. 1965. Amer. Atmos. Environ., 1(4):515-519, July 1967. ((12)) refs.

Criteria for judging what kind of film is likely to be most suitable for a given application are delineated. Information concerning supply sources of needed materials is provided.##

01922

F. Sawicki, R.A. Carnes, R. Schusacher

SPECTROPHOTOFLUORIMETRIC DETERMINATION OF 3-CARBON FRAGMENTS AND THEIR PRECURSORS WITH ANTHRONE. APPLICATION TO AIR POLLUTION. Mikrochim. Acta, No. 5 929-935, 1967. 5 refs.

Two modifications of an anthrone procedure for the characterization and determination of -CH-CO-CHO and -CH-CHO compounds and their precursors are described. Two main types of fluorescence spectra are obtained. The procedure for analysis of -CH-CO-CHO precursors works well for the aldopentoses; by comparison, aldo and ketohexoses react poorly. Water-soluble fractions of airborne particulates were analyzed by the anthrone procedure. At least three families of compounds were found; two give fluorogens, of which one is a -CH-CO-CHO precursor, and a third gives chromogen(s) absorbing at 423 and 540 microns. (Authors' abstract)##

01926

T. Heller, J. E. Sigsby, C. A. Clemons, and A. P. Altshuller

DIRECT APPLICATION OF GAS CHROMATOGRAPHY TO ATMOSPHERIC POLLUTANTS. Annal. Chem. 39R (7) 761-5R June 1967.

The use of a flame ionization detector permits direct determination of hydrocarbons at concentrations found in the atmosphere. Prior concentration of samples in a cold trap is not necessary. With the system described, the investigators were able to detect the lower molecular weight hydrocarbons found in automotive emissions in controlled irradiation studies. Ease of operation, high sensitivity, and reproducibility are advantages of the technique. Concentrations as low as 0.001 p.p.m. may be detected in air samples. The experimental parameters required to obtain these results are evaluated. Instrumental modifications required for several applications are discussed, with emphasis upon development of a reliable system with which the hydrocarbons at atmospheric concentrations can be determined routinely. (Author abstract)##

01971

S. Saltzman, H. Johnson, and T. W. Stanley

THE DETERMINATION OF NITRATE OR NITRATE PLUS NITRITE WITH AMINOPYRENE: APPLICATION TO AIR POLLUTION. Anal. Chem. 35, 1934-6, Nov. 1963.

A new procedure is introduced for the determination of nitrate or nitrate plus nitrite. The two ions can be determined together since they produce similar spectra and Beer's law curves. These ions can be determined in the presence of up to 50 equivalents of bisulfite. The new nitrate procedure, which utilizes 1-aminopyrene, is compared with the 2,4-xylenol, 2,6-xylenol, phenol-2,4-disulfonic acid, brucine, and chromotropic acid procedures. With the use of sulfamic acid, nitrate can be determined in the presence of 5 micrograms of nitrite ions. The advantages of the 1-aminopyrene procedure are that it is simple and direct and more sensitive than any method found in the literature. Amounts ranging from 0.04 (A equals 0.1) to 1.6 micrograms of nitrate nitrogen per milliliter of aqueous solution can be determined. The 1-aminopyrene procedure has been applied to the determination of soluble nitrates in airborne particulates. Nitrogen dioxide could be determined as nitrate plus nitrite with the new method. The procedure introduced for the determination of nitrate with 1-aminopyrene will be compared with these literature methods. (Author summary modified)**

01979

A. P. Altshuller

GAS CHROMATOGRAPHY IN AIR POLLUTION STUDIES. J. Gas Chromatog. 1, (7) 8-20, July 1963.

Gas chromatography as a powerful tool in the determination of the chemical composition of trace constituents in sources of pollution and in the atmosphere is reviewed. Topics covered include: Calibration Methods; Subtraction Techniques; Detectors (Thermal-Conductivity Detectors; Infrared CO2 Detectors; Electron-Impact Ionization Detectors; Argon Type Ionization Detectors; Flame Ionization Detectors; Flame Ionization Analyzers; Electron Capture Detectors); Column Selection; Identification and Quantitative Analysis; Atmospheric Analysis; Synthetic Atmosphere Analysis; Auto Exhaust Analysis; Blowby Emission Analysis; Diesel Exhaust Analysis; Incinerator Effluent Analysis.**

01981

V. Coppens and H. J. Paulus

MACROMOLECULAR COMPOUNDS ISOLATED FROM AIRBORNE PARTICLES BY ELECTROPHORESIS AND PAPER CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J. 23, 181-5, June 1962.

Paper chromatography and electrophoresis are used to isolate microquantities of two biologically significant compounds, "A" and "B," from samples of airborne particles. Electrophoretic

and chromatographic patterns are presented and discussed. A new rapid electrophoresis method is described which requires only two hours for separating a complicated mixture of aglycones. (Author abstract)##

01994

E. Sawicki, T. W. Stanley, and J. Pfaff

A COMPARATIVE STUDY OF VARIOUS METHODS FOR THE DETECTION OF FORMALDEHYDE. Chemist-Analyst 51, 9-11, Mar. 1962.

Identification limits for formaldehyde in various tests are discussed. Tests involving the reaction of CH_2O in H_2SO_4 with chromotropic acid, J-acid, phenyl J-acid and 2-hydroxycarbazole may be considered together since a polynuclear xanthylium dye is formed in all cases. The last reagent is the least selective; the first 3 are highly selective but react with CH_2O-releasing compounds in warm H_2SO_4. Heat is unnecessary with J-acid and phenyl J-acid for good results. Thus, most compounds that only release CH_2O in heated H_2SO_4 do not interfere in these 2 tests. The J-acid test may be conducted spectrophotofluorometrically, allowing 1 part of CH_2O to be detected in 2×10 to the 8th power parts of test solution. Acrolein can be differentiated from CH_2O by emission spectra. These H_2SO_4 reagents give positive results with aliphatic aldehydes; with 2-hydrazinobenzothiazole the test is more sensitive for CH_2O than for other aliphatic aldehydes. The 2-nitro-1,3-indandione test is very sensitive, especially when conducted spectrophotofluorometrically. The pure trimethine dye formed in the 1-ethyl-quinaldinium iodide test has a molar absorptivity of about 210,000 liters/mole cm. A similar selectivity was found with 1-ethyl-4-picolinium iodide as the reagent.##

01995

E. Sawicki, T. W. Stanley, J. Pfaff, and A. D'Amico

COMPARISON OF FIFTY-TWO SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF NITRITE. Talanta 10, 681-95, 1963.

This paper can be considered as a concise source of spectrophotometric methods for the determination of nitrite. Fifty-two methods, of which about 30 are new, are compared with respect to molar absorptivity, selectivity, sensitivity, simplicity, colour stability, and conformity to Beer's law. A new type of spectrophotometric procedure-autocatalytic in principle-is introduced; a molar absorptivity of 620,000 is obtained. Over 20 new methods have been shown to give higher molar absorptivities with nitrite than any of the former type of reagents. Consequently they are worthy of further investigation in respect of their application to the analysis of nitrites and nitrite precursors. (Author summary)##

01997

E. Sawicki and T. W. Stanley

DETECTION AND COLORIMETRIC DETERMINATION OF POLYNITRO AROMATIC COMPOUNDS. Anal. Chim. Acta 23, 551-6, 1960.

A sensitive new spot test for polynitro aromatic compounds is introduced. In most cases a blue to green color is obtained using fluorene (or some other polynuclear cyclopentadiene derivative) as the reagent. A colorimetric procedure for the analysis of o- and p-dinitro compounds is also presented. (Author summary)**

01998

T. W. Stanley

DETECTION OF POLYNUCLEAR DIARYL KETONES; APPLICATION TO AIR POLLUTION. Chemist-Analyst 49, 48 and 56, June 1960.

In air pollution research, the problem exists of assigning the strong carbonyl bands present in the infrared spectra of airborne This has prompted the development of new tests for specific classes of carbonyl compounds. This paper introduces a new method for the detection of diaryl ketones, $ArCOAr'$. With the exception of 2-benzoylthiophene, which gives a green color the test is fairly selective for diaryl ketones having an equivalent of three or more aromatic rings. It involves reaction of the ketone with methylmagnesium bromide and subsequent solution in trifluoroacetic acid giving red to blue colors of the diarylmethane dye ($ArC(CH_3)Ar'$) (plus). The colors formed are stable and show no fading even after four hours. Aliphatic, alicyclic, and aralkyl ketones do not give colors distinguishable from the yellow color of the blank.**

01999

E. Sawicki and H. R. Miller

DETECTION OF PYRENE, BENZO(A)PYRENE, AND OTHER POLYNUCLEAR HYDROCARBONS. Anal. Chem. 30, (1) 109-10, Jan. 1958.

A new color test has been developed for the detection of polynuclear compounds. A brilliant dark blue color was obtained with pyrene and benzo(a)pyrene. Some eight compounds gave red to violet colors. About 15 other hydrocarbons gave an essentially negative reaction. (Author abstract)**

02000

P. Hunigen, H. Jankuila, and R. Wettig

(THE REDUCTION OF CARCINOGENIC CONTAMINANTS IN EXHAUST GASES OF PETROL ENGINES THROUGH FUEL ADDITIVES AND CHOICE OF LUBRICANTS.) Die Herabsetzung Krebserzeugender Schadstoffe in Ottomotoren-Abgasen Durch Kraftstoffzusatze und Schmierstoffauswahl. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/12). pp. 191-3.

Data so far published about the content of 3,4 benzpyrene in the exhaust gases of petrol engines vary greatly. A measurement stand was set up to carry out routine tests on GDR made engines, and a quantitative analysis method worked out by the Berlin Institute for Hygiene employed thereby. Numerous measurements indicate that hitherto publications do not permit an objective evaluation of various types of engines. The reason seems to be the considerable degree to which the measurement value of 3,4 benzpyrene depends on the temperature at which the sample is taken from the exhaust gas. Results indicate: the lower the temperature at which the sample is taken the more hyperbolic the increase of the 3,4 benzpyrene content. Hence, comparing the amount of benzpyrene will only be meaningful as long as this is done under clearly defined and identical test conditions-as long as the pertinent causes remain unproven. Investigations of the effect exercised by fuel additives and lubricants which were carried out after the samples had been taken at comparable temperatures indicate that the latter make the 3,4 benzpyrene content practically disappear in the exhaust gases of two-stroke petrol engines, whereas this effect is only exercised at the beginning if the amount of lubricating oil is reduced, and is hardly exercised at all if the ratio is lower than 1:50. However, the hygienic evidence presented by the 3,4 benzpyrene measurements will remain unclear as long as the ways for and means of separating the substance from the carrier particles have not been found, and as long as this is only done by particulates with a magnitude of 100-5,000 mm. Further work should be done in this direction and for the purpose of laying down a MIK value.##

02077

E. Saviori M. Barry

NEW COLOUR TESTS FOR THE LARGER POLYNUCLEAR AROMATIC HYDROCARBONS. Talanta 2, (2) 128-34, March 1959.

An investigation of the reaction of the aromatic aldehyde-phosphorus pentachloride reagents with polynuclear aromatic hydrocarbons has shown that a number of aldehydes can be substituted for piperonal in this spectral test but only two were specific for the more basic aromatic compounds. The 9-anthraldehyde reagent gives intense bands in the 800-900 millimicron spectral region with the larger hydrocarbons. The 3-nitro-4 dimethylamobenzaldehyde reagent reacts readily procedure is ideal for the analysis of peri-condensed aromatic hydrocarbons. It was found that trifluoracetic anhydride could be substituted for phosphorus pentachloride in the test reagent, but no particular advantage was incurred by this substitution. (Author abstract)##

02078

E. Saviori, T.W. Stanley, W. Elbert

NEW METHOD FOR THE SPECTROPHOTOMETRIC DETERMINATION AND CHARACTERIZATION OF N,N-DIALKYLANILINES, DIPHENYLAMINES AND CARBAZOLES USING 5-NITROISATIN. Mikrochim. Acta 7, 1961.

N,N-dialkylanilines react with 5-nitroisatin chloride to give a blue-green chromogen with a characteristic absorption spectrum.

Aniline and N-alkylanilines give an essentially negative test. Determination of N,N-dialkylanilines and diphenylamine and carbazole derivatives is possible. (Author summary)**

02079

E. Sawicki W. Elbert

NEW METHODS OF DETECTION OF GLYOXAL. Talanta 5, 61-5, 1960.

In the new colour and fluorescent tests for glyoxal introduced in this paper it was found that a solution of the reactants on filter paper could be heated with one-inch wide jet of steam without any serious loss of solvent or acid. By this technique the reagents 1:2-dianilinoethane, 2:3-diaminonaphthalene and 2-aminothiophenol gave blue, green and blue stains respectively, with corresponding identification limits of 0.1,0.2 and 0.05 microgram of glyoxal. With 2-hydrazinobenzothiazole a golden-yellow fluorescence and an identification limit of 0.008 microgram of glyoxal was obtained. On the other hand, 0.1 microgram 2-aminothiophenol, 1 microgram 2:3-diaminonaphthalene, and 1 microgram 1:2-dianilinoethane could be detected with glyoxal as the reagent. (Author summary)**

02080

E. Sawicki, T.W. Staley, J. Pfaff, J. Ferguson

NEW METHODS FOR THE SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF FORMIC ACID. Anal. Chem. 1962. pp. 52-9.

This paper describes the development of sensitive and selective methods for the detection and determination of formic acid. The following spot tests are discussed: J-acid spot test; HBT (2-hydrazinobenzothiazole) spot test; MBTH (3-methyl-2-benzothiazolone hydrazone hydrochloride) spot test; 1-alkyl-quinaldinium spot tests. The optimum selectivity and sensitivity was obtained with 1-methylquinaldinium toluene-p-sulfonate; no interference was caused by ketones, aldehydes, and other acids. The other reagents are more sensitive, but extremely sensitive for formaldehyde. The J-acid spot test is the simplest and gives a brilliant yellow fluorescence. In spectrophotometric procedures, water was found to have a drastic effect on the intensity obtained, but high intensities were obtained with the amount necessary for the solution of formate salt. Yield of chromogens in quantitative methods with diverse quinaldinium and lepidinium salts ranged from about 7 to 43% and the sensitivity might well be improved. A decrease in the dilution factor (final vol. test solution vol.) would improve the sensitivities.**

02081

E. Sawicki W.C. Elbert

NEW SPECIFIC ANALYTICAL PROCEDURES FOR THE DETECTION AND CHARACTERIZATION OF 1,4-NAPHTHOQUINONES. Anal. Chim. Acta 23, 205-8, 1960.

A new sensitive and specific color test for 1,4-naphthoquinones is introduced. With the reagent, o-cresolthiophenol, a red color is obtained in neutral solution on paper. 1,4-Naphthoquinones containing electron-donor groups in the 2-position give a negative reaction. With additional spectrophotometric studies the quinones giving a positive test can be differentiated. A new specific fluorescence test for 2-hydroxy-1,4-naphthoquinone has also been developed. Reaction with o-phenylenediamine on paper and then treatment with alkali gives a brilliant rose-red fluorescence. (Author summary)##

02083

E. Sawicki W. Elbert

A SIMPLE SPECIFIC TEST FOR INNER-RING O-QUINONES. Anal. Chim. Acta 22, 448-51, 1960.

A simple specific test for inner-ring o-quinones is introduced. The test consists of the reaction of the quinone with 3,4-dimethoxyaniline in hot acetic acid to give dye(s) absorbing near 600 mu. Spot test and colorimetric modification of the test are described. Other types of quinones and ketonic compounds give negative results. The spectra of the o-quinones in acetic acid are also presented. With the new method, fairly specific tests are now available for (a) inner-ring p-quinones, (b) inner-ring o-quinones, and (c) terminal ring o- and p-quinones. (Author summary)##

02084

E. Sawicki, T.R. Hauser, F.T. Fox

SPECTROPHOTOMETRIC DETERMINATION OF ALIPHATIC ALDEHYDE 2,4-DINITROPHENYLHYDRAZONES WITH 3-METHYL-2-BENZOTHIAZOLINONE HYDRAZONE. Anal. Chim. Acta 26, 229-34, 1962.

A sensitive new spectrophotometric procedure is described for the analysis of aliphatic aldehyde 2,4-dinitrophenylhydrazones. The chromogens formed in the procedure absorb at 660 mu and are approximately three times as intense at this band as the starting aldehyde derivatives are in neutral and alkaline solvent at their wavelength maxima. With further improvement the procedure is capable of even greater sensitivity. Other aliphatic aldehyde derivatives also should be analyzable by this procedure, but 2,4-dinitrophenylhydrazones of ketones do not react. (Author summary)##

02085

E. Sawicki, T.W. Stanley, W. Elbert

SPECTROPHOTOMETRIC DETERMINATION OF AZULENE WITH ELECTROPHILIC REAGENTS. Proc. Intern. Symp. Microchemical Techniques 2, 431-42, 1961.

In a study of the composition of the atmosphere in terms of polycyclic aromatic hydrocarbons, analytical methods for various classes of these compounds have been recently developed. A study

is presented of ten different spectrophotometric methods for the microdetermination of acrolein. Seven of these methods are new, and two have been reported on recently. In most cases, electrophilic reagents are chosen that form intensely colored cationic chromogens with acrolein. The new reagents are 4-acetamidobenzenediazonium fluoroborate, indole-3-carboxaldehyde, flavylium perchlorate, xanthen-9-ol, 1-anthraquinonediazonium chloride, N,N-dimethyl-4-nitrosoaniline, and 5-nitroisatin chloride. The results with these reagents are compared with those obtained previously with N,N-dimethyl-4-aminobenzaldehyde, 3-methyl-2-benzothiazolone hydrazone, and 2-hydrazinobenzothiazole. In these diverse methods molar absorptivities are obtained ranging from 12,000 to 100,000. Optimum conditions for reactivity, sensitivity, selectivity, and stability are also discussed. (Author abstract)##

02006

E. Sawicki, T.R. Hauser, S. McPherson

SPECTROPHOTOMETRIC DETERMINATION OF FORMALDEHYDE AND FORMALDEHYDE-RELEASING COMPOUNDS WITH CHROMOTROPIC ACID, 6-AMINO-1-NAPHTHOL-3-SULFONIC ACID (J ACID), AND 6-ANILINO-1-NAPHTHOL-3-SULFONIC ACID (PHENYL J ACID). Anal. Chem. 34, (11) 1460-4, Oct. 1962. (Presented before the Division of Water and Waste Chemistry, 142nd Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1962.)

These highly selective procedures for the determination of formaldehyde and formaldehyde - releasing compounds are introduced. In all cases xanthylium cationic or dicationic dyes are formed. The procedures have sensitivities approximately two and one-half times that of the chromotropic acid method. A sensitive thermochromic blue spot test for formaldehyde with 6-amino-1-naphthol - 3 - sulfonic acid is described, and nine different methods for the determination of formaldehyde are compared. The interference of formaldehyde-releasing compounds is discussed. (Author abstract)##

02007

E. Sawicki, T.W. Stanley, S. McPherson

SPECTROPHOTOMETRIC DETERMINATION OF 1,4-NAPHTHOQUINONE AND ITS 2,3-DICHLORO DERIVATIVE. Chemist-Analyst 50, 101-4, Dec. 1961.

Some new color and fluorescent spot tests for the detection and characterization of 1,4-naphthoquinones have been reported. In the present paper, one of these test is extended to the selective and sensitive spectrophotometric determination of 1,4-naphthoquinone and its 2,3-dichloro derivative employing o-aminobenzenethiol as the chromogenic agent. As described previously, the color-forming reaction involves the formation of a hydroxybenzophenothiazine salt. For both 1,4-naphthoquinone and its 2,3-dichloro derivative, Beer's law is obeyed at 790 and 495 millimicrons over a concentration range of 1 to 27 micrograms per ml. of final solution. The molar absorptivities developed in the procedure at these two

wavelengths by both compounds are respectively, 15,000 and 16,000 liters per mole cm. Various substituted 1,4-naphthoquinones, such as the 2-hydroxy and 2-methyl derivative, give entirely different spectra with bands only 1/8 of the intensity of only 1/20 to 1/50 of the intensity of the 1-4 naphthoquinone. At 790 millimicron, their absorbance is negligible. The non-interference of many other types of compounds in the spectrophotometric procedure can be anticipated from the qualitative findings described previously.##

02088

E. Sawicki, T.R. Hauser

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF ALIPHATIC ALDEHYDES WITH 2-HYDROXYBENZOTHIAZOLE: APPLICATION TO AIR POLLUTION. Anal. Chem. 32, (11) 1414-8, Oct. 1960. (Presented before the Air Pollution Symposium, Division of Water and Waste Chemistry, 138th Meeting, American Chemical Society, New York City, Sept. 1960.)

A versatile new procedure for the detection and determination of aliphatic aldehydes is introduced. All modifications of the new procedure have an especially high order of sensitivity for formaldehyde. On the spot plate 0.01 microgram of formaldehyde, 0.3 microgram of acetaldehyde, and 0.3 microgram of propionaldehyde can be detected; on paper 0.05 microgram of formaldehyde, 1 microgram of acetaldehyde, and 1 microgram of propionaldehyde can be detected. With proper standards, the amount of formaldehyde can be estimated. A tube containing silica gel impregnated with 2-hydrazinobenzothiazole solution can be used to detect or estimate formaldehyde in the air or in auto exhaust gases. A new colorimetric method for the determination of formaldehyde has also been evaluated. It is reproducible and sensitive, and can be applied to the determination of formaldehyde in the air. In all these modifications an easily visible brilliant blue color is obtainable. (Author abstract)##

02089

E. Sawicki, J.L. Noe, F.T. Fox

SPOT TEST DETECTION AND COLORIMETRIC DETERMINATION OF ANILINE, NAPHTHYLAMINE AND ANTHRAMINE DERIVATIVES WITH 4-NITROBENZENE-DIAZONIUM FLUOROBORATE. Talanta 8, 257-64, 1961.

Some new sensitive procedures are introduced for the detection and and determination of aniline, alph and beta naphthylamines, and alph and beta-anthramines, as well as their N-alkyl and N,N-dialkyl derivatives. The chromogens are (p-phenylazophenylazo)-aniline, -naphthylamine and -anthramine dyes. For example with N,N-dimethylaniline, the blue di-cation of N,N-dimethyl-p-(phenlazophenylazo)aniline is formed. The absorptivity of N,N-dimethylaniline obtained in the colorimetric procedure is 0.823 microgram/ml/cm. In the analysis for N,N-dimethylaniline, Beer's Law was obeyed from 0.1 to at least 3.6 microgram per ml of final solution. Because of the widely differing rates of reaction, naphthylamine or anthramine derivatives can be determined in the presence of primary and secondary amines. Spot tests for aniline,

naphthylamine and anthramine derivatives are described, but their sensitivities does not compare with the sensitivities obtained in the colorimetric procedure. (Author summary)##

02090

E. Sawicki, T.R. Hauser, T.W. Stanley, W. Elbert, F.T. Fox

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC CHARACTERIZATION AND DETERMINATION OF CARBAZOLES, AZO DYES, STILBENES, AND SCHIFF BASES. APPLICATION OF 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE, P-NITROSOPHENOL, AND FLUOROMETRIC METHODS TO THE DETERMINATION OF CARBAZOLE IN AIR. Anal. Chem. 33, (11) 1579-9, Oct. 1961. (Presented before the Divisions of Analytical and Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

Two new spectrophotometric methods for the determination of carbazole are introduced. Beer's law was obeyed from 0 to more than 90 micrograms of carbazole in the 3-methyl-2-benzothiazolone hydrazone and p-nitrosophenol procedures. Both methods can be used for the estimation of carbazole in the benzene extracts of airborne particulates. Two new spot tests for carbazole are also introduced. With the p-nitrosophenol test, 0.4 microgram of carbazole can be detected. In strongly alkaline solution 0.2 micrograms of carbazole can be detected through the brilliant blue fluorescence of the anion. Carbazole can be characterized and estimated in the benzene extract of airborne particulates by the p-nitrosophenol spot test and spectrophotometric procedure, by the 3-methyl-2-benzothiazolone hydrazone (MBTH) spectrophotometric procedure, and by the excitation and emission spectra of the material in pentane, dimethyl-formamide, and alkaline dimethyl-formamide. The detection and determination of approximately 50 azo dyes and a smaller group of stilbene and Schiff base derivatives using 3-methyl-2-benzothiazolone are also described. (Author abstract)##

02091

E. Sawicki, T.W. Stanley, W. Elbert

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF AZULENE COMPOUNDS WITH 2-HYDRAZINOBENZOTHIAZOLE OR 3-METHYL 2-BENZOTHIAZOLONE HYDRAZONE. Microchem. J. 5, (2) 225-32, 1961.

Two sensitive new methods are introduced for the spot test detection and spectrophotometric microdetermination of azulene and its compounds. With 3-methyl-2-benzothiazolone hydrazone, 0.05 microgram of azulene can be detected. (Author summary)##

02092

E. Sawicki, T.W. Stanley, W.C. Elbert

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF AZULENE DERIVATIVES WITH 4-DIMETHYLAMINOBENZALDEHYDE. Anal. Chem. 33, (9) 1301-5, Aug. 1961.

The detection and determination of azulenes with 4-dimethylaminobenz-aldehyde have been investigated. One microgram of azulene, guaiazulene, or 2,4,6-trimethylazulene can be detected on a spot plate. These azulene compounds can be determined spectrophotometrically at 620 or 642 micrograms (for guaiazulene). Their molar absorptivities range around 90,000. The chromogenes formed in the procedure obey Beer's law from 0.1 to 8 micrograms of azulene compound per ml. of final solution. Spectrophotometrically it was possible to detect 1 part of the azulene compound in 5 million parts of test solution. (Author abstract)##

02094

E. Sawicki, T.W. Stanley, W.C. Elbert

SPOT TEST AND SPECTROPHOTOMETRIC DETERMINATION OF NITRITES AND AROMATIC NITROSAMINES WITH BENZALDEHYDE 2-BENZOTHIAZOLYLHYDRAZONE AND P-PHENYLAZOANILINE. Mikrochim. Acta 6, 891-8, 1961.

Nitrous acid is reacted with p-phenylazoaniline to give the diazonium salt which then combines with benzaldehyde 2-benzothiazolylhydrazone to give a formazan. Addition of alkali gives an intensely blue anion. (Author summary)##

02095

E. Sawicki W. Elbert

THERMOCHROMIC DETECTION OF POLYNUCLEAR COMPOUNDS CONTAINING THE FLUORENIC METHYLENE GROUP. Chemist-Analyst 48, 69-9, Sept. 1959

A large number of aromatic hydrocarbons and their derivatives contain the 6,5,6-fused, aromatic ring system of fluorene. A simple, sensitive, and specific test for this ring system would be of value in air pollution studies and in organic analysis generally. Sprinsak found that fluorene reacts in a strongly alkaline, pyridine medium with oxygen to yield fluorenone. Sawicki and co-workers found that fluorenone and structurally related ketones give a thermochromic reaction in dimethylformamide containing sodium borohydride involving reduction to the fluorenol and its anion. The new color test for the fluorene moiety is based on a combination of these observations. The fluorene derivative in dimethylformamide made alkaline with tetraethylammonium hydroxide forms a carbanion which is readily oxidized by shaking with air to the fluorenone, and the latter is reduced by potassium borohydride at the boiling point to the highly colored fluorenol anion. On cooling and shaking, the less highly colored fluorenone is regenerated.##

02096

F. Sawicki, T.W. Stanley, T. R. Hauser

A THERMOCHROMIC TEST FOR POLYCYCLIC P-QUINONES. Anal. Chem. 32, (12) 2005-8, Dec. 1958.

Many compounds containing a polycyclic quinone structure show a reversible thermochromic reaction in reducing media. This test is useful for unsubstituted polycyclic q-quinones, such as 9,10-anthraquinone, 5,12-naphthacenediones, 6,11-pentacenediones, 7,12-benzo(alpha)anthracenediones, and naphtho(2,3-alpha)pyrene-7,12-dione - e.g., boiling a pink dimethyl-formamide solution of 5,12-naphthacenediones in the presence of potassium borohydride gave a dark blue solution, which upon cooling became pink again. This color change can be repeated at least a dozen times. The color reaction has been applied to air particulate matter in that the presence of polycyclic quinone-like compounds has been demonstrated in the aromatic fraction. (Author abstract)##

02097

F. Sawicki, T.R. Hauser, T.W. Stanley, W. Elbert

THE 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE TEST. SENSITIVE NEW METHODS FOR THE DETECTION, RAPID ESTIMATION, AND DETERMINATION OF ALIPHATIC ALDEHYDES. Anal. Chem. 33, (1) 93-6, Jan. 1961.

Sensitive new analytical methods for water-soluble aliphatic aldehydes have been introduced. Versatile spot plate, paper, silica gel, and colorimetric modifications of the procedure are of value in the detection, estimation, and determination of these aldehydes. In the test procedure an intensely brilliant blue cationoid dye is formed. Particularly advantageous is the simple sensitive silica gel procedure for the detection or estimation of aldehydes. The color of the dye obtained in the colorimetric procedure for formaldehyde is much more intense than any of the colors obtained for formaldehyde with well known procedures. In the determination of formaldehyde, Beer's law was obeyed from 5 to at least 125 micrograms per 100 ml. of solution. The silica gel and colorimetric methods can be applied to the analysis of auto exhaust fumes and polluted air. Two simple methods for the synthesis of the reagent, 3-methyl-2-benzothiazolone hydrazone, are described. (Author abstract)##

02098

A.P. Altshuller I.J. Leng

APPLICATION OF THE 3-METHYL-2-BENZOTHIAZOLONE HYDRAZONE METHOD FOR ATMOSPHERIC ANALYSIS OF ALIPHATIC ALDEHYDES. Anal. Chem. 33, (10) 1341-2, Sept. 1961.

Presented in this study are results of work on fortified synthetic atmospheres which provide data on collection efficiencies and reproducibility and which give further indications of the

accuracy of the method. Analyses also were made for formaldehyde and acrolein; and results are compared with those for total aliphatic aldehydes.##

02121

R. E. Babina.

DETERMINATION OF CHLOROPRENE IN AIR. J. Anal. Chem. USSR (English Transl.) 20, (11) 1300-2, Nov. 1965.

Chloroprene was sampled by absorption on silica gel treated to free it of chlorine ions at a through-put rate of 0.5-1 liters/min. The chloroprene was then described by the passage of hot air into absorption flasks containing glacial acetic acid. Chloroprene was determined photometrically by coupling with p-nitrophenyl-diazonium. Error in this determination was plus and minus 20%.##

02130

R. Ebersnnberhorst

(ENGINE COMBUSTION AND ITS EXHAUST GAS PRODUCTS AS A PROBLEM OF HIGH INCIDENCE). Die Motorische Verbrennung und ihre Abgasprodukte als Haufigkeitsproblem. ATZ (Automobiltechnische Zeitschrift) (Stuttgart) 68(8):261-268, Aug. 1966.

The increasing incidence of gasoline engines necessitates reducing the air pollutants from exhaust gas by 90% within the next 10 years. The influence of engine operation on the emission of carbon monoxide, hydrocarbons and nitrogen oxides is described, e.g., in high gear, while changing gears and speeds (7-mode California test), and in neutral. Limiting values for emissions dependent on motor size and normal usage are suggested. Methods to reduce exhaust gas pollutants included fuel injection systems to replace carburetors and controlled turbulence techniques.##

02135

E. S. Gronsberg

(COLORIMETRIC DETERMINATION OF VINYL CHLORIDE IN THE AIR.) Kolorimetricheskoe opredelenie khloristogo vinila v vozdukhe. Khim Prom (Moscow) (7) 30-1, 1966.

The method described in this paper is based on the ability of ethylenic hydrocarbons to be oxidized by permanganate to glycol, which on further oxidation with periodic acid yields formaldehyde. The formaldehyde is then determined colorimetrically by reaction with chromotropic acid. The air to be analyzed was passed over activated charcoal; the charcoal was then extracted with a 1:1 mixture of glacial acetic acid and ethyl alcohol. The data indicate that vinyl chloride in air can be detected accurately in quantities as low as 0.5 mg/liter. Methyl alcohol will interfere with the reaction and must be removed by passage through water and CaCl2 before the vinyl chloride is absorbed on charcoal. Ethylene also interferes with the determination.##

02157

A. P. Altshuller, T. A. Bellar, and C. A. Clemons.

CONCENTRATION OF HYDROCARBON IN SILICA GEL PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS. Am. Ind. Hyg. Assoc. J. 23, Apr. 1962. pp. 150-6.

In the determination of substances in various atmospheres by gas chromatography the sample often must be concentrated prior to analysis. Silica gel at dry ice-acetone temperatures has been found to be a satisfactory adsorbant for concentration of hydrocarbon and sulfur containing compounds. In the present work recovery efficiencies are obtained for a number of four and five carbon paraffins and olefins. Isomerization reactions of olefins of silica gel at elevated temperature were investigated. Losses of very light hydrocarbons are discussed. Reproducibilities are given for the analyses of several three, four and five carbon hydrocarbons existing at concentrations between 0.005 and 0.2 ppm in synthetic smogs. (Author abstract) **

02158

A. P. Altshuller, L. J. Lagn, and S. F. Sleva.

DETERMINATION OF OLEFINS IN COMBUSTION GASES AND IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J. 23, 289-95, Aug. 1962.

Four-carbon and higher molecular weight olefins can be quantitatively determined in the gas phase by reaction with p-dimethylaminobenzaldehyde in concentrated sulfuric acid, heating at 100 C, and measurement of the absorbance at 500 millimicrons. The absorptivities are such that less than 0.1 ppm of gaseous olefins can be determined. Interference by formaldehyde is appreciable. Excess amounts of aromatic hydrocarbons and phenols interfere somewhat in the procedure. Simple methods for removing possible interferences in gas mixtures are discussed. The method has been applied to the analysis of automobile exhaust and diluted irradiated exhaust mixtures. (Author abstract) **

02159

A. P. Altshuller and C. A. Clemons.

GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS AT ATMOSPHERIC CONCENTRATIONS USING FLAME IONIZATION DETECTION. ANAL. CHEM. 34, (4) 468-72, APR. 1962. (PRESENTED BEFORE THE Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

In the present investigation, methods were developed for preparing and transferring to the chromatograph vapor state aromatic hydrocarbon in air-mixtures in the 0.05 to 5-p.p.m. range. Quantitative analysis of automobile exhaust for six- to 10- or 11-carbon aromatic hydrocarbons in the 1-to 10-p.p.m. range has been demonstrated. Quantitative analyses of synthetic photochemical "smog" have been made on mixtures containing individual aromatic hydrocarbons in the 0.05- to 1-p.p.m. range. The

accuracy attained is sufficient to permit measurement of changes in aromatic hydrocarbon concentration during irradiation with solar type light sources. These measurements provide evidence that many aromatic hydrocarbons should photooxidize to an appreciable extent in photochemical "smog" reactions in urban atmospheres. (Author abstract)##

02161

A. P. Altshuller and S. F. Sleva.

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS. Anal. Chem. 33, (10) 1413-20, Sept. 1961.

Four-carbon and higher molecular weight olefins can be determined quantitatively in the gas and liquid phases by reaction with p-dimethylaminobenzaldehyde in concentrated sulfuric acid, under appropriate conditions, and measurement of the absorbance at 500 millimicrons. With gaseous olefins, the absorptivities are such that 0.1 p.p.m. or less can be determined. Interference by formaldehyde and excess aromatic hydrocarbons and phenols is appreciable, and simple methods for their removal and discussed. The method has been applied to the analysis of automobile exhaust and diluted irradiated exhaust mixtures. Liquid olefins have been studied under somewhat different reaction conditions; consequently, the positions, shapes, and intensities of the absorption bands differ somewhat. Although the work on liquid olefins was not as extensive as in the investigation of olefin gases, the results should have applicability in the identification and analysis of small quantities of liquid olefins. (Author abstract)##

02162

A. P. Altshuller and S. F. Sleva.

VAPOR PHASE DETERMINATION OF OLEFINS BY A COULOMETRIC METHOD. Anal. Chem. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.) 34, (3) 318-22, Mar. 1962

An instrument based on a bromocoulometric method has been evaluated for analysis of olefins at concentrations between 20 and 1000 p.p.m. The instrument has been calibrated for its vapor phase response to a number of olefins, including ethylene, propylene, propadiene, 1-butene, trans-2-butene, cis-2-butene, isobutylene, 1,3-butadiene, 1-pentene, and 2-methyl-2-butene. The possible interferences of a number of substances, including sulfur dioxide, nitric oxide, nitrogen dioxide, hydrogen sulfide, n-butyl sulfide, acrolein, phenol, and o-cresol, has been investigated. Sulfur dioxide, hydrogen sulfide, nitrogen dioxide, and acrolein react appreciably with the brominating solution. Nitrogen dioxide lowers the response to olefins. Severe interference is experienced when the nitrogen dioxide concentration equals or exceeds that of olefins. Even when the olefins are present in excess, the interference by nitrogen dioxide is sufficient to necessitate removal of most of the latter. In analyses of samples in containers, direct determination of these vapor phase interference effects may be complicated further by gas

phase reactions of olefin and nitrogen dioxide, and perhaps by reactions within container walls. With this olefin instrument, diluted automobile exhaust and a variety of synthetic mixtures have been analysed. Results have compared favorably with those obtained by the colorimetric dimethylaminobenzaldehyde method. (Author abstract)##

02198

B. Bernis, and E. Vassiliou.

A CHEMILUMINESCENCE METHOD FOR DETERMINING OZONE. Analyst (Cambridge) 91, (1085) 499-505, Aug. 1966.

A method for determining ozone is described which is characterised by the direct recording and automatic determination of ozone within a wide range of concentrations. The development of the method is based on the use of a chemiluminescent solution that is stable and shows a linear relationship between the light emitted and the ozone concentration. The electronic instrumentation used is simple. Other methods of ozone analysis based on this principle met difficulty, owing to the direct oxidation of the chemiluminescent compound. The present method involves the use of gallic acid as an ozone acceptor, and rhodamine B which remains unchanged during the measurement as a photon emitter. Observations made with an oscillograph of the light emitted by single bubbles of ozonised air passing through the chemiluminescent solution gave valuable information about the response time of the system. (Author abstract modified)##

02205

J.W. Thomas, R.H. Knuth

PATTERNS OF AEROSOL PARTICLES SETTLING IN STREAMLINE FLOW IN A STRAIGHT HORIZONTAL TUBE. Intern. J. Air Water Pollution 10, (9) 569-72, Sept. 1966.

The theory of particles settling in streamline flow in a horizontal tube previously published has been expanded to take into account the influence of the sampling filter in changing the flow lines. Experiments with a 1.305 micron diameter monodisperse polystyrene latex aerosol have shown excellent agreement with the expanded theory. This modification of theory makes possible a new method of determining the settling velocity and density of a monodisperse aerosol. (Author abstract)##

02226

F. Sawicki, P.T. Fox, M. Elbert, T.R. Mauser, J. Meeker

POLYNUCLEAR AROMATIC HYDROCARBON COMPOSITION OF AIR POLLUTED BY COAL-TAR PITCH FUMES. Am. Ind. Hyg. Assoc. J. 23, 482-6, Dec. 1962.

Coal-tar-pitch pollution can be characterised by the large amounts of anthracene, phenanthrene, pyrene and carbazole present

in collected airborne particulates. Carbazole has not yet been found in pollution due to incomplete solid fuel combustion products or auto exhaust fumes. Coal-tar-pitch pollution is characterized by such higher F/BaP/BghiP, and BaP/Cor ratios when compared to other types of pollution. The large amounts of polynuclear hydrocarbons (and especially benzo(a)pyrene) often present in coal-tar-pitch polluted air indicate the necessity of a thorough study of this problem as it affects lung cancer.**

02227

E. Sawicki, E. Elbert, T.W. Stanley, T.R. Hauser, F.T. Fox

SEPARATION AND CHARACTERIZATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN URBAN AIR-BORNE PARTICULATES. Annal. Chem. 32, (7) 810-6, June 1960.

A simplified procedure is described for the characterization of polynuclear hydrocarbons in air-borne particulates. The method involves one pass through a chromatographic column and subsequent ultraviolet, visible, and fluorescence studies on the fractions thus obtained. The final step then involves a destructive method of analysis e.g., spectral analysis in sulfuric acid or a color test. The ultraviolet-visible absorption spectra of analogous fractions obtained from different communities are closely similar. In the air-borne particulates of some 100 communities pyrene, fluoranthene, benzo(a)fluorene and/or benzo(b)fluorene, chrysene, benzo-(a)anthracene, benzo(a)pyrene, benzo(e)pyrene, benzo(k)fluoranthene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene are found consistently.**

02211

R.L. Steinberg, R.J. Von Lehaden, R.P. Hangebrauck

SAMPLE COLLECTION TECHNIQUES FOR COMBUSTION SOURCES - BENZOPYRENE DETERMINATION. Am. Ind. Hyg. Assoc. J. 22, (4) 271-5, Aug. 1961, (Presented at the 22nd Annual Meeting, American Industrial Hygiene Association, Detroit, Mich., Apr. 1961.)

In evaluating combustion processes for their contributions of benzo(a)pyrene and other potential carcinogens to the atmosphere, the materials of interest may be lost during sampling unless the collection temperature is controlled. Cooling of the gases under both wet and dry conditions has been tried. This study demonstrates that collection of benzo(a)-pyrene from high temperature gas streams can be effectively accomplished by filtration after cooling the gas stream to or near ambient temperatures. A series of water bubblers and condensate traps immersed in an ice-water bath, followed by a high efficiency filter proved to be a satisfactory technique. (Author abstract)**

02248

F. DiRattai P. Malchioeri

EFFECTS OF ORGANOPHOSPHORUS ESTERS ON THE CILIARY MOVEMENT AND THEIR USE FOR THE DETECTION OF TRACES OF ORGANOPHOSPHORUS COMPOUNDS. Arch. Intern. Pharmacodyn. 153, (2) 339-45, Feb. 1965

A correlation was found between the acetylcholinesterase activity and the ciliary movement in cultures of ciliated epithelium cells. DFP (diisopropylfluophosphate) and paraoxon, added to the culture medium at concentration levels of 0.00001M and 0.0001M respectively, inhibited the acetylcholinesterase activity and increased the ciliary movements. Concentrations of 0.0001M of DFP and 0.001M paraoxon slowed the ciliary movements. DFP and paraoxon at concentrations which slightly inhibited the acetylcholinesterase activity increased the stimulatory effect of acetylcholine on the motility of ciliated cells. This effect may be used for the detection of very small quantities of organophosphorus compounds. (Author summary)##

02321

J.P. Fleech, C.H. Morris, A.F. Hugent, Jr.

CALIBRATING PARTICULATE AIR SAMPLERS WITH MONODISPERSE AEROSOLS: APPLICATION TO THE ANDERSEN CASCADE IMPACTOR. Am. Ind. Hyg. Assoc. J., p. 507-516, Nov.-Dec. 1967. 10 refs. (Presented at the American Industrial Hygiene Conference, Pittsburgh, Pa., May 16-20, 1966.

Monodisperse aerosols of methylene blue dye generated via a spinning disk and polystyrene latex aerosols generated via atomization have been applied in calibrating a multi-stage cascade impactor, the Andersen Sampler Model 020J. Previous calibrations of impactors relied almost exclusively upon the size-count method of analysis of test aerosols, usually polydisperse, retained at the deposition sites to determine their collection characteristics. Many difficulties encountered with this method are obviated by using nearly monodisperse aerosols for calibration. Collection efficiency characteristics of the Andersen Sampler are computed directly from mass retained at the deposition sites, since concurrent size distribution information on each aerosol generated indicates that values for number and mass median diameter are nearly equal. Experimental methods of generation, sampling, mass determination, and aerosol evaluation are presented with representative data. Collection efficiency curves obtained for the various stages of the Andersen Sampler are given with computed values of effective stage cutoff diameters for aerodynamically equivalent unit density spheres. Results are compared with those of previous experimenters. (Authors' abstract)##

02316

C. A. Parker and W. T. Rees.

DETERMINATION OF 3:4-BENZPYRENE IN THE ATMOSPHERE OF A SUBMARINE. Admiralty Materials Lab., Poole, England.

General Chemistry Div. (A.E.C. Report A/60 (R)) Mar. 1966. pp. 9.
DDC AD 486121

A direct method has been devised for the determination of the carcinogenic 3,4-benzopyrene in the cyclohexane extracts of the particulate matter collected from submarine atmosphres. The method depends on the measurement of the characteristic quasi-line emission spectrum shown by 3,4-benzopyrene when its solution in a mixture of cyclohexane and n-octane is frozen at liquid nitrogen temperature. Concentrations of benzopyrene less than 10 to the -9th power/ml of solution can be reliably identified without separation. The maximum amount found in the present trials corresponded to the concentration of 3,4 benzopyrene produced by the dispersion of the smoke from one cigarette in 70 cubic metres of air. (Author summary)**

02149

A. P. Altshuller.

NEEDS FOR NEW INSTRUMENTATION FOR MONITORING THE ATMOSPHERE FOR ORGANIC GASES AND VAPORS. Proc. Instr. Soc. Am. Natl. Analysis Instr. Symp., Charleston, W. Va., April 30-May 2, 1962. pp. 239-41.

The importance of high sensitivity and specificity in atmospheric monitoring instruments cannot be too strongly emphasized. For almost all organic analysis of urban atmospheres, instruments must be capable of detection at concentrations of 0.01 ppm or lower. Substances are present which can interfere in almost all conceivable analytical procedures for determining either a class of substances or an individual substance. Processes for removing the interferences or methods of correcting for them should be an integral part of the instrument development work. The detection methods suggested in this discussion involve either electrometric sensors or the ionization sensors used in gas chromatography. Alone or in combination with a chromatographic column, such detectors also have satisfactory specificities. These sensors offer considerable opportunity for the development of compact equipment. The range of possible application of these instruments covers many of the classes of organic substances of present interest in air pollution. (Author summary modified)**

02154

R.F. Chrisman R.E. Foster

CALIBRATION OF AUTOMATIC ANALYZERS IN A CONTINUOUS AIR MONITORING PROGRAM. Preprint (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Michigan, June 9-13, 1963.)

The need for uniformity of instrument calibration among the several stations of the Continuous Air Monitoring Program of the U.S. Public Health Service has prompted the development of a comprehensive program of instrument calibration. The program relies heavily upon static and dynamic checks performed by the station operators. The frequency of these checks varies with each specific instrument; but, in all cases, the checks

are frequent enough to insure the continued accuracy of the recorded data. The routine checks are substantiated and supplemented by dynamic calibrations performed at all stations by the headquarters staff. The dilution board method for the preparation of standard gas mixtures has been adapted to the requirements of compactness and portability, and has been used successfully in this work. In a conscientious effort to insure and maintain the accuracy of the data produced by the program, further refinements in the method will be made and more suitable new methods will be adopted as they are developed. (Author's summary)**

02158

L.R. Graiff

A RAPID-RESPONSE TOTAL EXHAUST HYDROCARBON DETECTOR. Preprint. (Presented before the Division of Water, Air, and Waste Chemistry, American Chemical Society, Detroit, Mich., Apr. 5, 1965.)

This paper discusses the development and use of a rapid response automotive exhaust hydrocarbon detector based on the hydrogen flame ionization principle. This instrument is ideally suited for monitoring the total exhaust hydrocarbon content of cycling engines. The rapid response exhaust hydrocarbon detector has been used to measure the hydrocarbon emission from a number of cars operated on a chassis dynamometer according to the AMPCO test procedure. A typical exhaust hydrocarbon emission pattern obtained from a car with a carbureted engine during one of the seven-mode warmup cycles is included, from which it is seen that the individual operating modes are well defined. A car with an inlet-port fuel-injection system was found to give a different emission pattern during deceleration from a carbureted car, as illustrated. The fairly positive fuel cut-off with the fuel-injection car during the early stages of deceleration is clearly indicated. The rapid response hydrocarbon detector can be used for purposes other than hydrocarbon emission from automotive engines. For example, the unit has been used to monitor the gases leaving a liquid-air trap in order to design an efficient hydrocarbon trap. The device can probably be used to monitor gas-turbine exhaust for unburned fuel.**

02170

R. Smith, A. H. Rose, and R. Kruse.

AN AUTO-EXHAUST PROPORTIONAL SAMPLER. INTERN. J. AIR WATER Pollution (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.) 8, 627-40, Sept. 1964.

The development of an instrument to obtain a proportional sample of auto exhaust gas is described. The proportional sampler is a servo device, which controls the flow of exhaust gas in the sampling line to maintain it at a fixed percentage of the carburetor air flow rate. The flow rates in carburetor and sample line are measured continuously by means of laminar-flow elements and associated pressure-difference transducers. The proportional sampler is used in a vehicle on the road to provide a

representative sample of exhaust gas, which is then analysed to obtained mole-fraction measurements of various air contaminants in the vehicle exhaust. The total volume of air entering the carburetor is also measured. The values for total air volume entering the carburetor and mole fraction of contaminants are used to calculate the emission rates in pounds of each air contaminant emitted per vehicle mile traveled. (Author abstract)##

02606

A.E. Barrington

INSTANTANEOUS MONITORING OF MULTICOMPONENT REVIEWED GASES. GCA Corp., Bedford, Mass. (Rept. CR-619.) Dec. 1966. 17 pp. CFSTI, NASA

Because of the urgent requirements of the manned space flight program, the prototype gas analyzers described below were developed specifically for aerospace applications. Their design thus inevitably was subject to restrictions of weight, volume and power consumption. Nevertheless, their operational performance has been most encouraging. The sensing element of the gas analyzer is called a mass spectrometer whose concept utilizes two basic physical phenomena: first, gaseous atoms and molecules can readily be charged electrically; second, there is a selective effect by electric and magnetic forces on such charged particles which depends on the atomic or molecular mass. A complete sampling and sensing system for 12 constituent gases, utilizing a magnetic deflection mass spectrometer is shown. It is designed to monitor H2, CO, CH4, NH3, H2O, N2, CON, O2, H2S, NO, CO2 AND COCN. IT includes 6 sample inlet capillaries, a calibration sample, a liquid nitrogen chilled sorption pump and an electronic ion pump.##

02615

E.W. Louw

ATMOSPHERIC POLLUTANTS AND THEIR ANALYSIS (SPECIAL REPORT SAMO 2). Council for Scientific and Industrial Research, Pretoria, (South Africa). Air Pollution Research Group 1966. 60 pp.

In view of the recently passed Act on Air Pollution (No. 45 of 1965) in South Africa and the anticipated increase in interest and analytical activity in this field, it was felt that the need existed for an up-to-date survey of air pollutants and their analysis. A review report was consequently prepared and is presented here. Aspects such as the types, sources and occurrence, concentrations and methods of analysis of the various pollutants are discussed. Also, recommendations are made with regard to the selection of suitable analytical methods. (Author abstract)##

02431

F. T. Whitby and R. A. Pueschl

EVALUATION OF OPTICAL PARTICLE COUNTERS (PROGRESS REPT.)
Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering
(Particle Lab. Publication No. 88) 89 pp., May 1965

Monodisperse polystyrene, India ink, and dioctyl phthalate aerosols have been used to evaluate the Royco, Southern Research Institute and prototype Bausch and Lomb optical counters. The cumulative particle size distributions measured by the counters of the monodisperse aerosols have been compared to the accurately determined microscope size distributions. The size ranges of the monodisperse aerosols used so are: 0.365 to 1.3 microns for polystyrene latex (PSL), 1 to 6 microns for polystyrene (PS), 1 to 10 microns for India ink (I.I.), and 1 to 5 microns for dioctal phthalate (DOP). These aerosols have been used to evaluate two characteristics of the counters: the ratio of the median size measured by the counter to that measured by the microscope (C/M), and the ability of the counter to resolve a monodisperse aerosol as measured by the geometric standard deviation (sg). Analysis of the standard deviation data shows that the resolving power of all three counters is close to the theoretical value for DOP and PSL aerosols larger than 1 micron, but is less than the theoretical value for the PS and I.I. aerosols larger than 1 micron as evidenced by an increase in standard deviation from about 1.3 at 1 micron to over 1.8 at 10 micron. The resolving power also decreases for PSL smaller than 1 micron. Analysis of the C/M data for PS and DOP shows that the counters respond alike to PS and DOP, that the absolute calibration of all three counters is good between 1 and 1.5 microns, but these show significant variations for both larger and smaller aerosols. The C/M ratios of the counters for I.I. varied from 0.2 to 0.5 and showed significant shape effects for aerosols larger than 5 microns. (Author summary modified)**

02439

A. V. Dmitriev, I. A. Rukhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 116.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Dmitriev's and I. A. Rukhov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Yekspressnyye Metody Opredeleniya V Vozdukhe Vrednykh Parov i Gazov), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early

determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

02460L

F.G. Sherrell J.A. Baltz

A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES. ARO Inc., Tullahoma, Tenn. (Rept. AEDC-TR-66-42) pp. 86, Mar. 1966
CFSTI, DDC AD 478006 I

A test in which wet air samples were analyzed for trace contaminants was conducted at the Arnold Engineering Development Center for the USAF School of Aerospace Medicine. Sample processing and analysis techniques used during the test are described. The sample processing technique provided a way to transfer the 77K condensables in each sample to a trap of small volume. This trap was designed to allow removal of small portions of both the sample vapor and the liquid for mass spectrometric and chromatographic analyses. The chromatographic and mass spectrometric instrumentation calibrations, and data reduction procedures are described. The basic test results are presented and discussed. Observations are made concerning the utility of the procedures used.##

02500

A. B. Calongne and J. F. Morris

NEW TECHNIQUES FOR TESTING TRACE HYDROCARBON CONTAMINATION OF GASES. Preprint. (Presented at the Fourth Annual Technical Meeting and Exhibit, American Association for Contamination Control, Miami Beach, Fla., May 25-28, 1965.)

This paper presents techniques for the analysis of total and nonvolatile hydrocarbons. Terminology used to define hydrocarbon limits in specifications include: (1) Total hydrocarbon content, (2) Condensable hydrocarbon content, (3) Oil content, and (4) Nonvolatile residue content. There are basically four methods of analysis which are used for the detection of low hydrocarbon concentrations. These methods are as follows: (1) Gas scrubber - infrared spectrophotometry. (2) Flame ionization. (3) Gas chromatography. (4) Gas cell - infrared spectrophotometry.##

02510

[CHEMICAL AND PHYSICAL CHARACTERIZATION OF POLLUTED ENVIRONMENTS, INHALED OR INGESTED, AND OF ACOUSTICAL "NUISANCES."]
Caracterisation chimique et physique des milieux pollues, inhales ou ingeres et des "nuisances" acoustiques. Int. Les pollution et "nuisances" d'origine industrielle et urbaine. Tome 1. leur prevention et les problemes scientifiques et techniques qu'elle pose en France, pages 27-32. Presses Min. Delegation generale a la recherche scientifique et technique.

In discussing the methodology of measuring and evaluating the degree of pollution, the following are considered: infra-red, emission, and mass spectrometers; x-ray and electron diffraction; gravimetric, volumetric, and colorimetric methods; optic and electronic microscopes, and spectometry for acoustic absorption. In the section on the inhalation milieu, are discussed the composition of the natural atmospheric air and of the air polluted by cities (particles, gases and vapors, and smog); diffusion of pollutants in the atmosphere; chemical reactions in the atmosphere; international standardization of current methods and measurements (deposited material, fumes, sulfur dioxide, and hydrocarbons); cartiography; and principal concerns of research. Discussed in this same section (chapter 3) are pollution of food and water, and problems of noise.##

02548

I. A. Pinigina

COLORIMETRIC DETERMINATION OF ALCOHOL VAPOR IN AIR. (O kolorimetricheskom opredelenii parov spirta v vozdukhe.) Hyg. Sanit. 31, (1) 58-60, Jan. 1966.
CFSTI: TT66-51160/1-3

The reaction of alcohols with black vanadium-hydroxyquinoline which produces a vivid orange color was modified by using sodium hydroxide to destroy any excess vanadium-hydroxyquinoline. The need of using xylene is thus eliminated. Benzene was substituted for xylen in the preparation of the scale. The air sample is absorbed on sorbent-activated charcoal. These modifications increase the sensitivity from 0.01 to 0.002 mg.##

02559

G.S. Solesnev I.A. Chernichenko

SPECTROPHOTOMETRIC DETERMINATION OF THE CONCENTRATION OF CHLORTETRACYCLINE IN THE AIR. (Opredelenie koncentracii khlortetratsiklina v atmosfernom vozdukhe spektrofotometricheskim metodom.) Hyg. Sanit. 31, (3) 396-8, Mar. 1966.
CFSTI: TT66-51160/1-3

The possibility of using spectrophotometry for the quantitative determination of chlortetracycline in the air was studied. Among the solvents investigated, the most suitable was 0.1 N. HCl solution, since this produced the highest optical density in the ultraviolet. The method is fairly sensitive (0.01 microgram/ml) but nonspecific, interference being encountered from other organic compounds which absorb similar wavelenghts.##

02581

R. Wettig

MODIFIED METHOD OF DETERMINING 1,4-BENZPYRENE IN THE ATMOSPHERE. (Modifitsirovannyi metod opredeleniya 1,4-benzpirena v atmosfernom vozdukhe.) Hyg. Sanit. 29, (6) 66-8, June 1964.
CFSTI: TT65-50023/6

For the purpose of determining 3,4-benzpyrene absorbed on dust particles in the atmosphere, benzene extraction is used in the majority of cases. The extract is subjected to chromatographic fractionation on columns; the fractions containing 3,4-benzpyrene are evaporated, and the residue is dissolved in cyclohexane. Benzpyrene is determined from absorption spectra in the ultraviolet region or by fluorescence spectra. The Orlemann method described by author is characterized, when the work is properly performed, by a high degree of sensitivity (0.5-1 micrograss of benzpyrene/ml), by a loss of material averaging 10-15%, and by reproducibility of the results. The polycyclic aromatic hydrocarbons interfering with quantitative evaluation of the benzpyrene spectrum (1,12-benzperylene, benzofluoranthene) are particularly well separated. The determination of 3,4-benzpyrene by the method described takes 1 1/2 - 2 days.##

02595

I. N. Al'shits, T. A. Anikina, E. A. Babenkova, and N. A. Grad

DETERMINATION OF STYRENE AND CUMENE HYDROPEROXIDE IN THE AIR WHEN THEY ARE PRESENT TOGETHER. (Opredelenie v vozdukhe stirola i giperisa pri ikh sovmestnom prisutstvii.) Hyg. sanit. 29, (9) 64-7, Sept. 1964.
CFSTI: TT65-50023/9

Of the known methods of determining styrene in air in the presence of cumene hydroperoxide the simplest and most specific is the Ivanov method, based on colorimetry of yellow products of styrene transformation by concentrated sulfuric acid. Of the known methods of determining cumene hydroperoxide in air in the presence of styrene the most sensitive and specific is the Alekseeva method, based on colorimetry of pink combination products of phenol and diazotized p-nitroaniline, obtained from the decomposition of cumene hydroperoxide by the action of concentrated sulfuric acid. Both methods are sufficiently sensitive and specific for the analysis of the air of rooms containing mixtures of styrene and cumene hydroperoxide.##

02601

V. I. Vasilkov, A. P. Volkova, V. N. Tsetlin, and E. F. Yankovskii

DETERMINATION OF THE TOXICITY OF PROPELLANTS USED IN AEROSOL TANKS. (Opredelenie toksichnosti propellentov, ispol'zuemykh v aerozol'nykh ballonakh.) Hyg. Sanit. 29, (10) 79-9, Oct. 1964
CFSTI: TT 65-50023/10

An azeotropic mixture of 60 percent tetrafluordichloroethane (Freon 114) and 40 percent octafluorocyclobutane (Freon C 318) was studied as a propellant for pesticide cylinders. Judging by the elasticity of the saturated vapors and the chemical stability, this mixture resembles that of Freons 11 and 12. The azeotropic mixture of Freons 114 and C 318 with concentrations used for practical purposes is non-toxic for warmblooded animals. A slight irritation of the mucous membranes of the eyes may occur if the concentration is exceeded 20-30 times, i.e., up to 10-15 g/cu. The mixture with the concentration of 15 g/m and over produced a slight narcotic effect. (Author abstract)##

02607

P. A. Korotkov, N. N. Serebrantova, V. P. Tayashchenko, and N. V. Vanysheva

DETERMINATION OF SMALL CONCENTRATIONS OF 1,2,5,6-DIBENZANTHRACENE. (Opredelenie malykh kontsentratsii 1,2,5,6-dibenzantratsena.) Hyg. Sanit. 29, (12) 59-60, Dec. 1964.
CFSTI: TT 65-50023/12

A sensitive and accurate method is suggested for the analysis of 1,2,5,6-dibenzanthracene. A detailed study of the luminescence of 1,2,5,6-dibenzanthracene in various crystalline matrices at the temperature of liquid oxygen was made. Of the solvents investigated, hexane was found to be the only solvent which gave a characteristic luminescence spectrum consisting of sufficiently narrow lines and bands at the temperature of liquid oxygen. In all other solvents, the bands were wide and amorphic and the corresponding wavelengths were impossible to determine with the accuracy required for the purpose of analysis.##

02657

G. Schonsuer

PARTICLE SIZE ANALYSIS OF PARAFFIN AEROSOLS BY ELECTRON MICROSCOPY. Staub (English Translation) 25, (4) 24-8, Apr. 1965.
CFSTI TT 66-51040/4

A method of determination of particle-size distribution of paraffin aerosol is described which enables spherical particles which are unstable in the electron microscope to be measured with an error below plus or minus 5%. The particles are precipitated in a thermal precipitator and, in order to maintain the spherical shape, are vapour treated with strong cooling. The shadows of the spheres are photographed and measured electron-microscopically. (Author summary)##

02685

H.G. Nettche

THE MEASUREMENT OF POLYCYCLIC AROMATICS IN THE ATMOSPHERE. Staub (English Translation) 25, (9) 41-6, Sept. 1965.
CFSTI TT 66-51040/9

Methods for collecting, separating and measuring aromatic polycyclic hydrocarbons in air are described. Investigations have shown that concentrations of 13 aromatics contained in dust corresponded, in a medium-size town, large town and industrial town of Nordrhine-Westphalia, to 1:1,5:2,5. In the industrial town the content of anthracene and phenanthrene was comparatively higher, and in the medium-size town the content of coronene as a result of special emission sources.##

02747

W. J. Jacumin and L. A. Rapperton

FURTHER EFFECTS OF TEMPERATURE AND PRESSURE ON PHOTOCHEMICAL OXIDANT PRODUCTION. J. Air Pollution Control Assoc. 14, (3) 95-7, Mar. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-101.)

Oxidant production was observed for a photochemical reactant system NO2 plus hexene-1 over a pressure range of 640 to 860 mm Hg at temperatures of 10, 25, and 35 C. An apparent inhibition took place around 710 mm at all temperatures. From a low at 710 oxidants values rose to a secondary peak at 700 mm and then dropped with decreasing pressure. The significance of these results is discussed. (Author abstract)##

02785

R. H. Linnell and W. E. Scott

DIESEL EXHAUST ANALYSIS (PRELIMINARY RESULTS). Arch. Environ. Health 5, 616-25, Dec. 1962.

Interest in the emissions from the exhaust of diesel engines on the road is rising mainly because interest in possible sources of air pollution has been steadily increasing. However, the problems of sampling and analysis of diesel exhaust have not been solved yet. This paper outlines of the techniques being used and some being evaluated for the first time for exhaust analysis. Many analytical problems remain to be solved. Some results are presented which are considered preliminary.##

02786

R. H. Linnell and W. E. Scott

DIESEL EXHAUST COMPOSITION AND ODOR STUDIES. J. Air Pollution Control Assoc. 12, (11) 10-5, Nov. 1962.

Some of the techniques being used and evaluated for exhaust analysis are outlined. Results except for some qualitative and tentative findings are shown in tables 1-8. Most values are averages of 2 or 3 determinations. These determinations were made on new samples taken at different times, with intervals of several weeks elapsing in some cases. Particulate matter information in table 1 indicates organic compounds adsorption. This is of interest in eye irritation and odor work since aldehydes may be present on particulate matter in higher concentrations than are present in the gas phase. The CCl4 extracts of particulate matter show infrared bands characteristic of hydrocarbons, olefins, aldehydes, and carbonyl. Comparison of hydrocarbon measurements, formaldehyde and acrolein, and miscellaneous compounds are discussed. 26 references.##

02795

E. Sawicki, T. W. Stanley, W. C. Elbert, and J. D. Pfaff

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO THE ANALYSIS OF ATMOSPHERIC POLLUTANTS. Simplified Analysis for Benzo(a)pyrene. Preprint. (Presented at the 152nd Meeting, American Chemical Society, New York City, Sept. 13, 1966.)

Rf values and fluorescent colors have been obtained through thin-layer chromatography of 20 polynuclear aromatic hydrocarbons with the following absorbents and developers: alumina with pentane:ether (19/1;v/v), cellulose acetate with ethanol:toluene:water (17/5/4; v/v) and cellulose with dimethylformamide:water (1/1, v/v). Of the three absorbents alumina gave the best separation of fluorescent organic compounds from the organic fractions of airborne and air pollution source particulates. The pattern and fluorescent color of the spots of a thin-layer chromatogram varied with the type of pollution. In samples from communities with different types of pollution different types of patterns were obtained. The different fractions obtained from organic airborne particulates - e.g. aliphatic, aromatic neutral oxygenated, basic, acidic, and water-soluble fractions - exhibited entirely different patterns. The cellulose acetate absorbent system gave best results for the separation of the benzpyrene fraction obtained in column chromatography. The cellulose absorbent system gave the best results for the separation of the polynuclear aromatic hydrocarbons. The greatest range in Rf values was obtained with this absorbent. Two methods for the estimation of benzo(a)pyrene following thin-layer chromatography are described. One method involves ultraviolet analysis at 395 micrograms; the other method involves spectrophotofluorometric analysis in sulfuric acid. (Author summary)**

02796

Sawicki, E., H. Schwacher, and C. R. Engel

COMPARISON OF RNTH AND OTHER METHODS FOR THE DETERMINATION OF SUGARS AND OTHER ((ALPHA))-GLYCOLIC DERIVATIVES. APPLICATION TO AIR POLLUTION. Microchem. J., 12(3):377-395, Sept. 1967. 15 refs.

Methods for the determination of aldoses, ketoses, and other alpha-glycolic compounds are described. The various methods are compared through their use in the determination of ribose. These methods include the direct and oxidative RNTH, and the seuiene, J-acid, orcinol, and pyrogallol procedures. The oxidative RNTH procedure introduced in this paper is especially sensitive for the determination of alpha-glycolic compounds as shown by the high molar absorptivities (=Approx. 100,000) obtained for ethylene glycol, glycerol, and other polyols. Airborne particulates obtained from various cities contain a substantial amount of water-soluble alpha-glycolic compounds. In addition, a variety of dust samples have been found to contain a large quantity of water-soluble alpha-glycolic compounds and lesser amounts of adsorbed aliphatic aldehydes. Chromatographic media were found to be contaminated with these chemicals. (Author abstract)**

02797

E. Sawicki, W. Elbert, T. W. Stanley, T. R. Hauser, and F. T. Fox

THE DETECTION AND DETERMINATION OF POLYNUCLEAR HYDROCARBONS IN URBAN AIRBORNE PARTICULATES. I. THE BENZOPYRENE FRACTION. Intern. J. Air Pollution 2, 271-82, Mar. 1960.

A new simple procedure for the determination of benzo(a)pyrene in complex mixtures is introduced. A comparison of the concentration of benzo(a)pyrene in the air of nine cities for the month of November, 1958, is given. Evidence is presented for the identification of each hydrocarbon found in the benzopyrene fraction. The relative concentration of benzo(a)pyrene, benzo(e)pyrene, benzo(k)fluoranthene and perylene in the nine cities is approximately constant. (Author abstract)##

02798

E. Sawicki, J. Hoe, and T. W. Stanley

A NEW TEST FOR THE DETECTION OF ARALKYL AND DIALKYL KETONES CONTAINING THE CO-CH2-GROUPING. Preprint. 1960.

A new simple color test for dialkyl and aralkyl ketones containing the structure, R-CO-CH2-, is introduced. Limits of identification for some 50 ketones are recorded. A positive test is revealed by a blue and occasionally a violet color with wave length maxima ranging from 560-590 millimicrons. The advantages and the shortcomings of the test are discussed. (Author summary)##

02799

E. Sawicki and J. L. Hoe

A SENSITIVE NEW METHOD FOR THE DETERMINATION OF NITRITES AND NITROGEN DIOXIDE WITH 4-AMINOAZOBENZENE-1-NAPHTHYLAMINE. Anal. Chim. Acta 25, 168-9, 1961.

A sensitive method for the determination of nitrites is introduced. The method should also be applicable to the determination of nitrogen dioxide. The test consists of the reaction of 4-aminoazobenzene and 1-naphthylamine with nitrous acid to form the blue dication of 4-(p-phenylazophenylazo)-1-naphthylamine. Beer's law was obeyed from 0.5 to over 15 micrograms of nitrite ion per 15 ml of final solution. Spectrophotometrically it is possible to detect part of nitrite ion in 60 million parts of solution. (Author summary)##

02601

E. Sawicki, T. W. Stanley, and J. Noe

SIMPLE SENSITIVE TEST FOR COMPOUNDS CONTAINING THE CYCLOPENTADIENE CH2 GROUPING. APPLICATION TO AIR POLLUTION. Anal. Chem. 32, 816-7, June 1960.

The reaction of 1,3-dinitrobenzene, 1,4-dinitrobenzene and 1,8-dinitronaphthalene in alkaline solution with compounds containing the cyclopentadiene CH2 group results in a stable blue to green color with long wave length maxima ranging from 600 to 750 millimicrons. The wave length maxima and identification limits obtained from the reaction of 1,3-dinitrobenzene with over 100 fluorene derivatives have been tabulated. In a neutral aromatic fraction this test appears to be specific for the cyclopentadiene CH2 grouping. The presence of fluorene and benzo(a)-and/or benzo(b)-fluorene in airborne particulates has been confirmed with the help of the test procedure. (Author summary)##

02602

E. Sawicki and T. R. Hauser

SPECTROPHOTOMETRIC DETERMINATION OF 4-AMINOAZOBENZENES, 4-AMINOSTILBENES, SCHIFF BASES, AND ANALOGOUS COMPOUNDS WITH 1-METHYL-2-BENZOTHIAZOLONE HYDRAZONE. Preprint, 1961

1-Methyl-2-benzothiazolone hydrazone is shown to be a powerful and versatile electrophilic reagent which can be used for the spectral detection and determination of strongly nucleophilic molecules containing a carbon atom of high electron density. The determination of approximately 50 azo dyes and a smaller group of stilbene and Schiff base derivatives by a new procedure for these compounds is described. 4-Amino-, 4-alkylamino, and 4-dialkylamino derivatives of azobenzene can be readily analyzed. The determination of N,N-dialkyl-4-aminoazobenzene was thoroughly investigated. Beer's law was obeyed from 1 to more than 70 micrograms of compound per 10 ml of final solution. The color was stable for approximately 1/2 hour. The molar absorptivity for N,N-dimethyl-4-aminoazobenzene was 70,000. N,N-Dimethyl-p-aminostilbene reacted readily in the procedure; it had a molar absorptivity of 119,000. The procedure should prove of value in the detection and determination of two types of carcinogens, the aminoazobenzenes and the aminostilbenes. (Author summary modified)##

02605

E. Sawicki, T. R. Hauser, and T. W. Stanley

ULTRAVIOLET, VISIBLE, AND FLUORESCENCE SPECTRAL ANALYSIS OF POLYNUCLEAR HYDROCARBONS. Intern. J. Air Pollution 2, 253-72, Mar. 1960. (Presented at the 136th National Air Pollution Symposium, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A novel approach to the analysis of polynuclear hydrocarbons in mixtures is introduced. On the basis of this approach a new

simple, sensitive, and specific test for benzo(a)pyrene was developed. In a mixture of 50 compounds containing benzene, naphthalene, anthracene, phenanthrene, benzo naphthalene, anthracene, phenanthrene, benz(a)anthracene, benzo(e)phenanthrene, chrysene, pyrene, benzo(b)fluoranthene, benzo(e)pyrene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene, benzo(a)pyrene can be identified unequivocally. The UV visible, activation, and fluorescence spectra in pentane of a large number of polynuclear hydrocarbons are presented. The fluorescence intensities of the different hydrocarbons are compared. Some, like anthanthrene and perylene, have an extremely high intensity, which simplifies their detection in a mixture. The sensitivity of the fluorometric methods are of the order of milimicrograms per milliliter, or parts per billion. From a comparison of the activation spectra in pentane and sulfuric acid of different hydrocarbons, it can be ascertained whether a given hydrocarbon can be determined in the presence of hydrocarbons of somewhat similar structure. In many instances it is possible to obtain the pure fluorescence spectrum of an aromatic hydrocarbon by determining the spectrum of the mixture at an appropriate activation wavelength maximum of the aromatic hydrocarbon. Thus benzo(e)pyrene can be determined in the presence of benzo(a)pyrene, and vice versa. Perylene or anthanthrene can be detected readily in a complicated mixture of some 25 analogous hydrocarbons. Naptho(2,1-a)pyrene can be detected in a mixture of 50 polynuclear hydrocarbons. Many other possibilities are apparent from an examination of the activation spectra of the hydrocarbons. The quenching effect of a fairly high concentration of miscellaneous compounds in a mixture as it affects fluorometric analysis for some particular hydrocarbons is also discussed. (Author abstract)

02841

E. Sawicki and H. Johnson

NEW METHOD FOR THE PHOTOMETRIC DETERMINATION OF PRIMARY AMINES. Chemist-Analyst 55, 101-3, Oct. 1966.

A highly selective and sensitive method for the photometric determination of primary amines, including amino acids and aliphatic and aromatic amines has been devised based on the reaction of the amine with succinaldehyde formed in situ from 2,5-dimethoxytetrahydrofuran, and then reaction of the N-substituted pyrrole formed with p-(dimethylamino) benzaldehyde (Procedure A) or with p-(dimethylamino) cinnamaldehyde (Procedure B). Amides, pyrimidine and purine amines, and secondary and tertiary amines do not undergo the reactions and do not interfere.##

02848

Jackson, R. W.

ANALYSIS FOR EXHAUST GAS HYDROCARBONS - NONDISPERSIVE INFRARED VERSUS FLAME-IONIZATION. J. Air Pollution Control Assoc. (Presented at the Instrument Society of America, New York City, Oct. 1965.) 11(12):697-702, Dec. 1965.

An investigation has been made of the suitability of a nondispersive infrared analyser and two flame-ionisation analysers for measuring the total hydrocarbon concentrations of automobile exhaust gas. The investigation consisted of measuring relative responses of various hydrocarbons, checking for possible exhaust gas interferences and finally comparing exhaust hydrocarbon concentrations indicated by the flame-ionisation analyser to those indicated by the infrared analyser. The infrared analyser has high relative responses for paraffins and low responses for olefins, acetylenes, and aromatics. Also, the infrared indicated hydrocarbon concentrations must be corrected for exhaust water vapor interference.##

02654

R. Marcali A.L. Linch

PERFLUOROISOBUTYLENE AND HEXAFLUOROPROPENE DETERMINATION IN AIR.
Am. Ind. Hyg. Assoc. J. 27, (4) 360-8, Aug. 1966.
(Presented at the 26th Annual Meeting, American Industrial Hygiene Association, Houston, Tex., May 6, 1965)

Both perfluoroisobutylene (PFIB) and hexafluoropropene (HFP) react in methanol with a mixture of pyridine and piperidine to produce a stable yellow color at 25 C which is measured spectrophotometrically at 412 millimicrons or visually compared with permanent secondary standards. In the presence of acetic acid only HFP undergoes the color-forming reaction with piperidine. The PFIB concentration can be determined by difference. The effect of various halogenated compounds with and without the R-C equals CF2 (R equal -F, -CF3) function is presented. With a 0.1-cubic-foot sample at 25 C, the method will detect 0.1 ppm of PFIB or 0.02 ppm of HFP. A lightweight easily portable field kit with a "Gal-Jet" aspirator has been developed for field surveys. (Author abstract)##

02675

C. D. Watkins and D. F. Hillman

THE EXAMINATION OF COMMERCIAL SOLVENTS BY GAS-LIQUID CHROMATOGRAPHY. PART I. ALIPHATIC HYDROCARBONS. Chemical Inspectorate, London (England). (CS Memo. 185) Dec. 1965. 17 pp.
DDC AD 481883

Aliphatic hydrocarbon solvents are of major industrial importance and find uses in a wide range of products, e.g. paints, cleaning solvents, fuels, polishes, etc. Gasoline, petroleum ethers, white spirit, kerosene and similar solvents are complex mixtures of aromatic, naphthenic and aliphatic hydrocarbons with the latter type as the main component. In the simplest cases there are comparatively few ingredients but as the boiling range increases the number of possible constituents increases enormously. Such solvents can however be identified by comparing the chromatogram of the sample with that of known solvents under similar conditions. This has been done successfully for many years but occasionally the chromatograms of samples have not matched those of the standards, or alternatively agreement has been only moderate, with

consequent uncertainty as to whether other ingredients have been deliberately added or whether the discrepancy is due to variations between different manufacturers' specifications for what is nominally the same solvent. The main purpose of this report is to list a number of fingerprint chromatograms for such solvents and in some cases to consider the variations between products from different sources. A second purpose is to outline methods for specific separations e.g. of aliphatic and aromatic solvents.##

02966L

H. Konosu and Y. Hashiba

DESIGN OF A NON-DISPERSIVE ULTRAVIOLET GAS ANALYZER AND ITS APPLICATION TO QUANTITATIVE MEASUREMENT OF TRACES OF TOXIC GASES AND VAPORS IN AIR. (Hibunsangata Shigaisen Gasu Bunsekikei no Shisaku oyobi Sono Yugai Gasu,Joki Bunseki no.1 Kogyo Kagaku Kenshi 68, 1868-72, 1965. (U.M.I. Translation 2127)
DDC AD 622365

A non-dispersive UV gas analyser for measuring the concentration of toxic gases and vapors in the air is reported. This analyser is a device which measures simultaneously the differences in the UV absorption of a standard gas and a test gas over the total range of wave lengths. The optical source employs a hydrogen discharge tube and the optical system is a complex optical path system. The gas cell is 50 cm long and a secondary electron multiplier is used as an optical receiver tube. This analyser was used to measure 6 types of samples and to compile detection lines. Values for the sample and detection limits (ppm) were 1 for sulfur dioxide, 20 for carbon disulfide, 27 for benzene, 33 for acetone, 38 for methyl ethyl ketone, 13 for trichloroethylene. The relative error below 100 ppm for sulfur dioxide was plus or minus 9.0% plus or minus 4.0% for 100-1000 ppm, and 1.5% for 1000-1250 ppm. This method can be used for 1-min measurements, for the measurement of toxic gases and vapors in working environments, and for determining lower explosive limits. (Author abstract modified)##

02963

H. S. Schlipkoter

THE INJURIOUS EFFECTS OF ATMOSPHERIC DUSTS. Staub English Transl.1 25, (10) 2-11, Oct. 1965.
CFSTI: TT66-51040/10

Increasing industrialization, growing population, traffic density and closeness of industrial areas and residential districts necessitate the continuous measurement, analysis and control of air pollutants. Each method must be selected critically. Proposals are made for a suitable dust measuring method. The effect of air pollutants on breathing and, in particular, their influence on the purifying action of the lungs must be considered first of all. More attention must be paid to dust as a carrier and catalyst, to cope with its cytotoxic effects and to polycyclic aromatic compounds. Instructions for controlling air pollution should take into account the protection of such persons. (Author summary)##

03010

R. Devorkin, R.L. Chase, A.P. Fudurich, C.V. Kanter

SOURCE TESTING MANUAL. Los Angeles County Air Pollution Control District, Calif. 181 pp., Nov. 1965

Specialized methods and techniques for the curtailment of contaminants being released into the atmosphere, developed in the laboratory and in the field are described in this manual. These methods are concerned primarily with the measurement of emissions from stationary sources, and in general, with little or no modification, these methods can also be used for testing vehicles or other moving sources. Information obtained from source tests is invaluable as a guide in selecting appropriate control equipment and improving the design of future installations to minimize the discharge of air contaminants. Following topics are discussed: Planning a source test; Determination of gas flow rate; Collection and analysis of particulate matter, and of gaseous constituents; Odor measurement; Source test report. The appendices deal with rules and regulations, conversion factors and constants, and auxiliary field sampling equipment.##

03059

A. P. Altshuller and I. R. Cohen.

APPLICATION OF DIFFUSION CELLS TO THE PRODUCTION OF KNOWN CONCENTRATIONS OF GASEOUS HYDROCARBONS. Anal. Chem. 32, (7) 802-10, June 1960

Diffusion coefficients have been determined for a number of hydrocarbons, including 2-methyl-1, 3-butadiene, hexane, 1-hexene, heptane, 1-octene, decane, benzene, and toluene. Diffusion coefficients at a number of temperatures have been determined for hexane, 1-hexene, heptane, 1-octene, decane, and benzene. The effect of turbulence at the end of the diffusion tube, resulting from the rapid flow of carrier gas over the top of the tube, has been investigated as a function of gas flow rate, temperature, diffusion tube diameter, and tube length. These results, with related data in the literature, should aid in defining the experimental limits within which a diffusion tube apparatus may be operated so that calculated values of diffusion rate can be used, if one experimental value of the diffusion coefficient is available for the liquid compound of interest. (Author abstract)##

03080

F. Sawicki

THE SEPARATION AND ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS PRESENT IN THE HUMAN ENVIRONMENT. Chem. Anal. (Warsaw) 9:1, 29-6, 28-30, 56-62, 88-91, 1964

The steadily increasing rate of lung cancer has stimulated efforts to analyse the polynuclear hydrocarbons which are

a group of carcinogens with which human beings come into contact with in varying degrees. Because the polycyclic hydrocarbons are present usually in very low concentrations together with thousands of other types of compounds, separation is an essential part of their determination. Methods used to accomplish this separation include: sublimation, distillation, solid-liquid extraction, liquid-liquid extraction, column chromatography, paper chromatography, thin-layer chromatography, gas chromatography. These methods are reviewed along with analysis procedures involving absorption spectra, fluorescence spectra and phosphorescent spectra. Two hundred and forty references are included.##

03081

E. Sawicki, T.R. Hauser, S. McPherson

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF COMPOUNDS CONTAINING THE P-HYDROXYSTYRYL GROUP; 3-METHYL-2-BENZOTHIAZOLINONE HYDRAZONE PROCEDURE. Chem. Anal. (Warsaw) 50, 69-9, Sept. 1961

In the present study the reagent was applied to the detection and determination of compounds containing the p-hydroxystyryl or p-alkoxystyryl grouping. The test is highly selective for phenols containing a p-vinyl group (and their ethers) as compared to phenols (and ethers) without a vinyl group. It is possible that phenols with an o- or m-vinyl group will react as phenols to give a red-orange color. A p-hydroxy compound having a allyl group, i.e., where a methylene group is placed between the ethylenic double bond and the benzene ring, gives practically no reaction. Eugenol and safrol show this phenomenon and the slight reactions observed are probably due to impurities such as isoeugenol and isosafrole. The spot test procedure was tried with several derivatives of p-hydroxystyrene which gave a reaction in the spectrophotometric procedure. The identification limits ranged from about 0.1 to 0.7 microgram. Phenol and polycyclic phenols gave negative results.##

13096

N.A. Lyshkow

A RAPID AND SENSITIVE COLORIMETRIC REAGENT FOR NITROGEN DIOXIDE IN AIR. J. Air Pollution Control Assoc. 15, (10) 491-6, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965)

High speed instrumentation requires a colorimetric reagent capable of detecting traces of nitrogen dioxide with little delay for color development. Rate of color development and sensitivity of Griess-type reagent have been improved by adding a promoter (N-salt) and optimizing the concentrations of diazotizing and coupling reagents. Field tests show that the new instrument-reagent combination can resolve short-duration peaks in NO2 concentrations of 5 to 10 ppbs. (Author abstract)##

03101

J. Harkins S.W. Nicksic

STUDIES ON THE ROLE OF SULFUR DIOXIDE IN VISIBILITY REDUCTION. J. Air Pollution Control Assoc. 15, (5) 218-21, May 1965.

Highly sensitive radiotracer techniques were used to see if the sulfuric acid mist from sulfur dioxide oxidation allows the incorporation of organic matter. Tagged organic compounds were irradiated with and without sulfur dioxide. When the aerosol was filtered off, no radioactivity was found on the filter paper showing the absence of organic matter and the lack of sulfur dioxide synergism. (Author abstract)##

03112

E.R. Stephens W.A. Price

A SEARCH FOR SOME NITRO-OLEFINS IN POLLUTED AIR. J. Air Pollution Control Assoc. 15, (7) 320-2, July 1965.

An electron capture chromatographic method of detecting nitroethylene and 1-nitro-1 propene was developed and applied to ambient air samples, photolysed propene/nitrogen dioxide mixtures and auto exhaust. No trace of either compound was found in ambient air or in the photolysed mixtures. The detection limit was estimated to be 1 ppb. A single sample of auto exhaust showed several small peaks which, if attributed to nitro-olefin, would amount to insignificant traces. (Author abstract)##

03185

D. L. Vennesky and W. B. Monie.

METHOD FOR ON-SITE DETERMINATION OF RESIDUAL ADSORPTIVE CAPACITY OF CHARCOALS USED IN CLOSED ENVIRONMENTAL SYSTEM. Naval Research Laboratory, Washington, D.C. (NRL Memorandum Rept. 1710); Aug. 31, 1966. 21 pp.
CFSTI, DDC AD 639145

The relationship between the moisture content of adsorbent-type charcoals and their residual adsorptive capacity for organic compounds was studied. Investigation of fourteen charcoal samples from submarine main-carbon filters has shown that the moisture content of the charcoals correlates with the organic loading previously determined by a steam desorption method. A simple apparatus for determining the moisture content of a charcoal sample was devised, in which continuously recirculated air in a closed-loop system transfers water from a charcoal sample to a desiccant. The moisture content of the charcoal is determined by weighing the sample and desiccant tubes before and after water transfer. The on-site determination of the residual adsorptive capacity of main-filter charcoals is suggested by the low cost of the closed-loop apparatus and the simplicity of the method. For a monitoring procedure, a reference charcoal sample, prepackaged for handling ease, could be exposed to submarine atmospheres, thus avoiding the removal of samples from the main-filter bed. Rather than a fixed exposure period, the

remaining adsorptive capacity of the charcoal would determine the time for replacement. Safety is enhanced, since heavy organic loading of the charcoal brought about by unusual circumstances could be rapidly detected. Since 70% of the charcoal samples which were investigated had more than half of their adsorptive capacity remaining, substantial savings should result. Some charcoals meeting the requirements of specification MIL-C-17605A are anomalous with respect to water content; this behavior is being investigated. (Author abstract)##

03251

Sawicki, E. and H. A. Carnes

SPECTROPHOTOFLUORIMETRIC DETERMINATION OF ALDEHYDES WITH DIMEDONE AND OTHER REAGENTS. Mikrochim. Acta (Vienna , No. 1:148-159, 1958. 16 refs.

Two new reagents, dimedone and 1,3-cyclohexanedione, are introduced for the fluorimetric determination of aliphatic aldehydes. Six fluorimetric methods for the determination of formaldehyde and other aldehydes are compared. Of the selective methods for the determination of formaldehyde the J-acid procedure is recommended when a high order of sensitivity is necessary, the 2,4-pentanedione method when a high order of selectivity is desirable. The dimedone procedures are recommended when it is necessary to analyze for aldehydes other than formaldehyde. However, the dimedone procedures are the most sensitive for the determination of formaldehyde and can be used for this purpose where conditions are appropriate and maximal sensitivity is necessary. These various procedures should also be useful in the analysis of various types of aldehyde precursors.##

03254

H. S. Tipson, A. Cohen, and A. J. Fatiadi

AIR POLLUTION STUDIES. National Bureau of Standards, Washington, D.C. (NBS Technical Note 505) 1-20, 1966

The oxidation of polycyclic aromatic hydrocarbons is described. Results are reported for the oxidation of naphthalene, anthracene, phenthrene, pyrene, and perylene with a variety of oxidants. Oxidation products are identified where possible. The results obtained with periodic acid as an oxidant are particularly noteworthy. Studies of photooxidation of the polycyclic hydrocarbons on silica gel, alumina, soil, and air-borne particulate matter have revealed, for each hydrocarbon, products that may arise in contaminated air under many conditions. (Author abstract)##

03267

H. F. Sweeney and J. N. Pattison

A NEW AUTOMOBILE EXHAUST ANALYTICAL TRAIN. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 99-105 pp.

Data has been developed to permit the recommendation of the dilution technique with a hexane detector to minimize zero shift problems. It is suggested that the hexane detector may be operated at a span of about 3000 ppm, with dilution ratio of 3 to 1. It is recommended that the flow through the instruments be in parallel. It is concluded that the propylene detector gives results relative to hexane which are in the direction expected for variations between high and low emitting autos and vehicles.##

03291

S. Maimstrierk, and H. Feldstein

THE DETECTION AND ESTIMATION OF PART PER BILLION CONCENTRATIONS OF HYDROCARBONS. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1960.)

A liquid nitrogen freeze-out step has been added to the gas chromatographic analysis of hydrocarbons using a flame ionization detector. Concentrations in the low ppb range of C2 and higher hydrocarbons can accurately be determined. Contaminant concentrations of these compounds have been measured in nitrogen, helium and hydrogen cylinders. (Author summary)##

03594

J. H. Sullivan, D. H. Robertson, and C. Merritt, Jr.

THE DETERMINATION OF THE VOLATILE COMPONENTS OF FOODSTUFFS. III. COFFEE AROMA. Quartermaster Research and Engineering Center, Natick, Mass., Pioneering Research Division. (Research Report Analytical Chemistry Series No. 13.) (Presented before the Division of Agricultural and Food Chemistry, 135th National Meeting, American Chemical Society, Boston, Mass., Apr. 1959.) Sept. 30, 1959. 16 pp.
(PB171 DDC 636311

Mass spectrometric analysis has led to the identification of several components of coffee aroma. The volatile compounds from ground roasted coffee are collected by distillation under high vacuum at room temperature into a receiver at liquid nitrogen temperature. Direct fractionation of a "center cut" on the mass spectrometer and subsequent analysis has shown the presence of more than twenty compounds. Among the compounds identified are furans, aldehydes, esters, alcohols, nitriles and sulfur compounds. The techniques which have been used offer the following advantages: (1) The method of collection by vacuum distillation in a closed system is superior to other methods of collection. (2) A minimum of sample handling reduces greatly any loss of material. (3) Direct analysis on the spectrometer permits a complete qualitative analysis in a rapid, efficient manner and also provides for the extension to quantitative analysis, if desired. (Author abstract)##

01169

S. Hantzsch and R. E. Fieschet

ANALYZING AMINE TRACES IN ATMOSPHERIC AIR. GIAUB (English Transl.) (Duesseldorf) 26, (8) 28-32, Aug. 1956.

A report on the concentration of primary aliphatic amines in air is given. Absorption tests on low concentration of amines in air were carried out in diluted hydrochloric acid, using wash bottles and impingers. Material losses during the concentration of absorption solutions were also evaluated. Practical experience in extracting primary aliphatic C1 to C8 amines with amylacetic ester is reported. Reaction of primary amines with ninhydrine was used for photometric amine determination. (Author summary)##

01425

S. B. Smith and P. J. Grant.

A NON-SELECTIVE COLLECTOR FOR SAMPLING GASEOUS AIR POLLUTANTS [FINAL REPT.]. Pittsburgh Coke and Chemical Co., Research and Development Dept. Dec. 15, 1958. 61 pp.

Tests of the retentive power of various adsorbents indicated activated carbon is superior to silica gel and molecular sieves for the non-selective collection of air pollutant gases. When dry ice is used as a refrigerant on a carbon column it is possible to collect methane and all gases of lower volatility in a sample of reasonable size. Certain oxidizing gases such as No, NO2 and O3 appear to react with activated carbon and must be considered separately. Columns of various sizes were tested over a wide range of gas concentrations and a column containing 55 grams of Pittsburgh BPL activated carbon chosen to sample 20 liters of air for light contaminants. A smaller column for operation at room temperature containing 1.5 grams of the same carbon may be used ahead of the refrigerated column to collect C4 and higher compounds from 100 liters of air. A field collector kit was designed which affords a preliminary filtration and drying of the air sample, positive displacement measurement of the sample volume, continuous flow measurement and mechanical pumping of the air sample. A helium flushing system for the refrigerated collector is also provided to remove the bulk of air adsorbed from the sample. Prototype columns were tested satisfactorily for retention under exaggerated test conditions on selected hydrocarbon vapors. A few recovery runs indicated that good recovery can be confidently expected after further experimental development of recovery techniques. (Author summary)##

01810

R. S. Watson.

SPECTROPHOTOMETRIC AND CHROMATOGRAPHIC METHOD OF MONITORING SPACECRAFT ATMOSPHERES. Perkin-Elmer Corp., Norwalk, Conn.; Electro-Optical Div. 24 pp.; Jan. 1964.

The basic principles of spectrophotometry and its application to spacecraft atmosphere monitoring, using a miniaturized CO2 sensor

are described. Also included is a brief summary of the elements of gas chromatography and a comparison of spectrophotometric and gas chromatographic techniques that indicates the way they complement each other for space instrumentation.##

01648

A. P. Altshuller and A. P. Wartburg.

PRESSURE-BROADENING EFFECTS ON INFRARED PEAK INTENSITIES OF HYDROCARBONS. Appl. Spectry. 15, (2) 57-9, 1961.

The pressure-broadening effects of one atmosphere of air or of carbon dioxide on various infrared bands of hydrocarbons have been investigated. Large pressure-broadening effects are shown by ethylene at 10.52 microns and acetylene at 3.1 and 13.7 microns, moderate effects by acetylene at 7.5 microns and propylene at 10.35 microns, and small effects by 1-butene at 10.85 microns, trans-2-butene at 10.375 microns, and benzene at 9.50 microns. The variation of absorbance at several of the infrared absorption maxima of ethylene and acetylene was investigated using varying partial pressures of air or carbon dioxide at fixed partial pressures of the 2 hydrocarbons. (Author abstract)##

01649

Farmer, J. H. and J. D. Williams

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 182p., Dec. 1966. 71 refs.

The development of an effective air resource management program begins with the determination of what pollutants are in the air, the quantity of each, and where they originate. The aerometric network was designed and operated to determine the nature and extent of air pollution in the Metropolitan St. Louis area. Once the air pollution problem is defined, the emission inventory and the opinion surveys can be used in connection with air quality criteria to set the air quality goals. Then the aerometric network will be used to monitor the air to insure the goals are attained. The salient portions of this report are the tabular data on particulates, gaseous pollutants, and material deterioration.##

01665

R. J. D. Low and S. Coleman

THE MEASUREMENT OF INFRARED EMISSION SPECTRA USING MULTIPLE-SCAN INTERFEROMETRY. Preprint. 1964

A multiple-scan interference spectrometer is described, as are exploratory experiments on the application of the instrument to observe low-temperature emission spectra from solid surfaces. The instrument is highly sensitive and could be used for transmission, reflection, and emission spectroscopy, especially in situations where the signals obtained are weak. (Author abstract)##

03520

B. I. Larsen

PARAMETERS OF AEROMETRIC MEASUREMENTS FOR AIR POLLUTION RESEARCH. Am. Ind. Hyg. Assoc. J. 22,(2) 97-101, Apr. 1961.

A brief description of a continuous gas sampling network is presented in which a number of air pollutants is to be measured in six United States cities beginning about mid 1961. Parameters are presented of aerometric measurements from a two year study of sulfur dioxide in Louisville, Kentucky, to be related to health and other effects. Six equations are developed to depict the frequency, duration, and air pollution dosage. (Author abstract)##

03521

F. Sawicki

ORGANIC SPECTROPHOTOMETRIC ANALYSIS - REVIEW. Record Chem. Progr. (Kresge-Hooker Sci. Lib.) 22, (3) 249-60, 1961.

This paper is not a critical evaluation of procedures in the literature; it is essentially a review of our recent work. The detection and determination of trace amounts of chemicals in the human environment has become one of the prime factors in the necessary attempt to understand and control all aspects of this environment. The chemical composition of the atmosphere is one phase of this problem which is being probed by various methods of trace analysis. These analytical methods are generally applicable to the analysis for micrograms or nanograms quantities of organic compounds in extremely complicated mixtures. A knowledge of collection techniques, separation procedures, organic synthetic chemistry, and absorption and fluorescence spectrophotometry (as applied to the ultraviolet, visible, and infrared regions of the spectrum) is invaluable in the origination and application of such methods.##

03522

B. O. McCaldin

EVALUATING AIR POLLUTION PROBLEMS (ACCEPTABLE EQUIPMENT AND PROCEDURES). Arch. Environ. Health 2, 228-31, Mar. 1961.

Some of the more common equipment used in making environmental air quality determination, such as Hi-Volume Samplers, Filter Tape Samplers, Gas Samplers, and simplified monitoring techniques, are discussed. Hi-Volume Samplers are frequently used to measure suspended particulate which may consist of smoke, dust, or other solids small enough to remain air-borne for long periods. This includes particulates under 100 microns in diam, and, for the most part, those less than 1 micron in diam. Fiber glass filters commonly used with this sampler collect practically all particulates down to 0.3 micron in diam. The sampler itself consists of a vacuum cleaner motor with mounting to accomodate an 8-in by 10-in filter. Filter tape

samplers are commonly used in the field studies and usually are equipped with a diaphragm pump to draw air through at a rate of about 7 liters/min. Various automatic instruments are used for the continous collection and recording of gaseous pollutants. However, various manual or semimanually operated bubbler collection trains have been used in the majority of gaseous measurements. Simplified monitoring techniques are discussed in conjunction with dustfall sulfation rates, H_2S, corrosion and fluoride sampling.##

015437

T. H. Haunser, D. W. Bradley

EFFECT OF INTERFERING SUBSTANCES AND PROLONGED SAMPLING ON THE 1,2-DI-(4-PYRIDYL)ETHYLENE METHOD FOR DETERMINATION OF OZONE IN AIR. Anal. Chem., 39(10):1144-1146, Aug. 1967. 4 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 153rd Meeting, ACS, Miami Beach, Fla., April 1967.)

A new method for the sampling and analysis of ozone in the atmosphere involves the collection of atmospheric ozone in a solution of 1,2-di-(4-pyridyl)ethylene (PE) in glacial acetic acid, reaction of the ozone with the PE via the ozonolysis reaction to form pyridine-4-aldehyde, and colorimetric analysis of the resultant pyridine-4-aldehyde using a modification of the 3-methyl-2-benzothiazolone hydrazone method. This paper describes the effect of two additional analytical parameters on the PE method. These parameters, namely the effect of possible interfering substances present in the atmosphere and the effect of prolonged sampling time on final analysis, are very important when any analytical procedure is applied to the field analysis of atmospheric contaminants. The results demonstrate that the method can be used for 24-hr. sampling simply by increasing the volume of absorbing solution since there is no loss of collected ozone from the absorbing solution during a 24 hr. sampling period due to a possible aeration effect.##

015421

L. Buckner, F. B. Taylor, W. E. Scott, R. J. Wimette

DIESEL EXHAUST COMPOSITION, ODOR AND EYE IRRITATION (PROGRESS REPORT MAY 1, 1966 TO FEB 15, 1967. Preprint 1967.

Further work with the two-cycle 6-cylinder V-type diesel engine is reported which which covers solid and liquid particulate emissions at various operating conditions, odor intensity and eye irritation observations by a human panel at these operating conditions, analyses of the particulate for polycyclic aromatic hydrocarbons and further analyses of the gaseous emissions by long-path infrared and colorimetric techniques. A number of polycyclic aromatic hydrocarbons, including benzo(a)pyrene and several other compounds with reported positive biological activity, have been detected in diesel exhaust by fluorescence spectroscopy. The concentrations of most polycyclics were highest from 1/2 load to 7/8 load with a sharp decrease from 7/8 load to full load. The benzo(a)pyrene concentrations found in diesel exhaust (0.6 to 7.8 micrograms per cubic meter) were

lower than the 0.5 micrograms per cubic meter recently reported for automobile exhaust, but the diesel produced more benzo(a)pyrene (0.15 to 1.1 milligrams) per gallon of fuel than the automobile (0.27 milligrams). Fluorescence analyses of new and used lubricating oil and the rate of oil consumption indicate that the contribution of the oil to the exhaust particulate of this engine is negligible. Values for the emissions of nitrogen dioxide have been revised downward as a result of using an improved sampling technique which minimizes the oxidation of nitric oxide to nitrogen dioxide. Of the three engine operating modes studied, the odor intensities and eye irritation observed by the human panel were lowest at the 1200 RPM-1/4 load condition. It is believed at this time that the eye irritation from the exhaust can be accounted for by the formaldehyde and acrolein found in the exhaust. There is no clear-cut correlation, however, between the concentrations of these aldehydes and the odor differences observed.##

01544

H. E. Saltzman H. Gilbert

RICHOOSTERMINATION OF OZONE IN SMOG MIXTURES (NITROGEN DIOXIDE EQUIVALENT METHOD). Am. Ind. Hyg. Assoc. J. 20, 379-86, Oct. 1959.

A new method has been presented for conveniently and specifically determining low concentrations of ozone in polluted air, even in the presence of large amounts of other commonly occurring oxidizing or reducing gases. Ozone was stoichiometrically converted to (and determined as) nitrogen dioxide, by addition of controlled amounts of gaseous nitric oxide to the sample air stream and allowing a short reaction flow time. Better than 95% conversion was obtained in a convenient apparatus which was developed, when 1 p.p.m. excess nitric oxide and forty seconds reaction time were used. In the short time allowed, oxidation of nitric oxide by air and organic oxidant was negligible. Results for pure ozone were in good agreement with those of an iodide reagent. For synthetic smog oxidant mixtures (generated by the ozone reaction with 1-hexene) the method appeared specific for ozone, whereas the iodide reagent also responded to organic oxidants. (Thus the mixture could be differentiated into two oxidant components by simultaneous application of the two methods.) Reducing gases such as sulfur dioxide and hydrogen sulfide did not appreciably interfere even in one hundred to one ratio to ozone. The method should make possible interesting new data for polluted air. It should be readily adaptable to automatic recording of ozone in smog without interference from associated pollutants. (Author summary)##

01569

A. J. Andreatch and B. Feinland.

CONTINUOUS TRACE HYDROCARBON ANALYSIS BY FLAME IONIZATION. Anal. Chem. 32, (8) 1021-6, July 1960. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Pa., Feb. 1960.)

An inexpensive, rugged, and portable flame ionization detector has been designed for the continuous analysis of trace amounts of hydrocarbons. The detector is insensitive to inorganic gases but responds to hydrocarbons in proportion to the carbon atom content. A detectable limit of 1 p.p.b. of hexane is obtainable. As an automotive exhaust analyzer, the unit can first measure total unburned hydrocarbons, and then by introducing an 8-inch silica gel column, the unit can determine methane, ethane, ethylene, acetylene, and propylene. (Author abstract)##

03592

S. T. Cuffe

AIR POLLUTANTS FROM POWER PLANTS (TECHNIQUES FOR EVALUATING AIR POLLUTANTS). Arch. Environ. Health 6, 422-7, Mar. 1963. (Presented at the 27th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 24-25, 1962.)

The objective of the study is to evaluate the emissions of oxides of nitrogen, oxides of sulfur, polynuclear hydrocarbons, total hydrocarbons, total solids, formaldehyde, organic acids, and common metals in the gases emitted from various types of coal-burning power plants which may be useful in establishing the range of atmospheric emissions under various conditions of operation. Determination of the efficiencies of control equipment is also essential for the long-range objective of reducing total air pollution. This paper describes the sampling and analytical techniques used in evaluating the several types of emissions under study.##

03679

A. P. Altshuller and I. R. Cohen

SPECTROPHOTOMETRIC METHODS FOR OLEFINS (COLORIMETRIC DETERMINATION OF CONJUGATED DIOLEFINS). Anal. Chem. 32, (13) 1802-8, Dec. 1960. (Presented at the Division of Water, Sewage, and Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City N. J., Sept. 1959.)

In a new colorimetric method conjugated diolefins are coupled with 2-methoxyethanol-phosphoric acid solvent medium. Isoprene-type diolefins couple to form products with strong absorption near 490 millimicrons, while butadiene couples to form a product with a maximum near 405 millimicrons. The intensities of these maxima are linearly related to concentration between at least 0.1 and 10 millimicrons per ml. for isoprene-type diolefins and 20 and 200 micrograms per ml. for 1,3-butadiene. A 2- to 8-hour reaction period is necessary to obtain optimum intensities. No appreciable interference occurs from paraffinic, acetylenic, simple aromatic, and most other types of olefinic hydrocarbons. Some aldehydes, ketones, and phenols interfere moderately. Isoprene has been efficiently collected and determined from dilute isoprene-air mixtures, and in several liquid mixtures containing various other hydrocarbon components, including 1,3-pentadiene, unconjugated diolefins, and various types of mono-olefins. (Author abstract)##

01680

A. F. Altshuller, D. L. Miller, and S. F. Sleva

DETERMINATION OF FORMALDEHYDE IN GAS MIXTURES BY THE CHROMOTROPIC ACID METHOD. Anal. Chem. 33, (9) 822-5, Apr. 1961. (Presented before the Division of Water and Waste Chemistry, 138th Meeting, American Chemical Society, New York City, Sept. 1960.)

The modification of the chromotropic acid method for formaldehyde proposed by West and Sen has been investigated. With only minor variations, the present study confirms the previous findings of reagent concentrations, color stability of the product, and the stability of the reagent solution. A much more detailed investigation of the possible interference of olefins, alcohols, aldehydes and ketones, aromatic hydrocarbons, phenols, and of nitrogen dioxide has been made. Nitrogen dioxide, most aldehydes and ketones, and straight-chain alcohols do not interfere significantly. The interference of olefins and aromatic hydrocarbons can be largely eliminated by the use of appropriate sampling conditions. (Author abstract)##

01684

A. F. Altshuller and I. R. Cohen

DETERMINATION OF PRIMARY NITROPARAFFINS BY THE NITROUS ACID REACTION. Anal. Chem. 32, (7) 802, June 1960.

Nitrous acid reactions with primary nitroparaffins, dinitroparaffins, and a variety of nitroalcohols are reported. To an aqueous solution of a sample containing a nitroalkane, about 0.1 gm of KOH was added to ensure solution; 0.25 gm of $NaNO_2$ and 0.6 ml of 10N H_2SO_4 were added; the solution was shaken with 10 ml of diethyl ether and the layers were separated. The aqueous layer was transferred to the absorption cell. Absorbance at 330 millimicrons was read 5 min after mixing. The final alkaline aqueous extract of 1-nitropropane has an absorption band at 330 millimicrons due to the formation of sodium propylnitrolate. The reaction of HNO_2 with nitroparaffins gives solutions with red-orange or red-brown colors of low intensity, resulting from far weaker absorption in the visible spectrum than that found at 330 millimicrons. The blue color resulting from the reaction of HNO_2 with secondary nitroparaffins is also of low intensity and the visible absorption observed is not usable for determinations in the microgram range. Interferences were determined for a number of other aliphatic nitro compounds. Primary amines as well as large amounts of secondary amines will interfere with the analysis of the primary nitroparaffins.##

01727

A. F. Altshuller, S. F. Sleva, A. F. Wartburg

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS IN CONCENTRATED SULFURIC ACID. Anal. Chem. 32, (8) 946-54, July 1960. (Presented before the Division of Water, Sewage, and

Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A new spectrophotometric method for the determination of small quantities of olefins is based on the absorbance produced in the 300 to 310 millimicron range from their reaction with concentrated sulfuric acid. The procedure is insensitive to ethylene under all conditions studied and to propylene concentrations below 1500 p.p.m. Propyl and higher molecular weight alcohols react to form absorbing products at 300 millimicron. Some higher molecular weight aldehydes, nitrogen dioxide, and sulfur dioxide interfere moderately. The method has been applied to the analysis of a number of two component liquid mixtures and to gas mixtures containing butenes, 1-hexene, or 1-hexene-benzene in air. The experimental evidence favors carbonium ions as the absorbing species. (Author abstract)**

03732

F. Drone J. E. Smith

ANALYSIS OF CHLORINATED HYDROCARBONS WITH THE GAS CHROMATOGRAPH. Am. Ind. Hyg. Assoc. J. 22, (1) 36-41, Feb. 1961. (Presented at the 21st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 25-28, 1960.)

The qualitative and quantitative behavior of eleven chlorinated hydrocarbons on the gas chromatograph was investigated for possible application to the analysis of their vapors in air. Relative retention volumes and quantitative standardization curves are given. Methods for the sampling and measurement of chlorinated hydrocarbons in air are described. (Author abstract)**

03771

J. Ray

ODOR THRESHOLDS OF SOLVENTS FOR ASSESSMENT OF SOLVENT ODORS IN THE AIR. STAUB (English Transl.) 26, (9) 34-8, Sept. 1966. Ger (Tr.)

Detection limits of thirty seven (37) solvents were investigated to determine their odor thresholds. Quantitative analyses of vapor concentrations of the solvent mixtures were carried out using gas chromatography. Directives for the limitation of solvent vapor emissions are proposed.**

03828

Pantinger, John V.

ANALYTICAL TECHNIQUES FOR IDENTIFICATION OF GAS-OFF PRODUCTS FROM CABIN MATERIALS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th) Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, ARML-TR-65-230, p. 279-295, Nov. 1965.
CFSTI, DDC: AD 629622

A program was initiated to identify the gas-off products from a variety of candidate space craft materials and to estimate the concentration and gas-off rates of these potential space contaminants. Eventually 50 materials will be tested and approximately 1000 analyses will be performed. A listing of general types is presented. Some standard procedures for establishing minimum detection levels are needed. The simple methods of weight loss from thermal degradation or olfactory sensing, as used in the Mercury program, will not suffice. As shown in this study, the highly sensitive detection system of gas chromatography and the specific identification possible with supporting mass spectrometry and infrared absorption spectrophotometry fulfill most criteria. The techniques employed in this program were developed for application to survey a wide range of materials. In each material system, more optimum instrument conditions, particularly gas chromatography operation, could be established. It is felt that with improved gas chromatography techniques, considerably lower detection levels can be established. The biggest problems in standardization of methods are sample preparation and handling. There are many variables, e.g., freshness of sample, surface area, mixing, curing, sample uniformity and changes in proprietary mixes, which can influence the nature and degree of gas-off products. Early results indicate that standardization of methods for gas chromatography and mass spectrometry can best be accomplished for individual sample types, e.g., silicone polymers, rather than a single comprehensive approach. Each system produces different gas-off products, which require different analyses. Also, the most significant data can be obtained when the materials are evaluated in the approximate form for final use.##

03829

Saunders, Raymond A.

ATMOSPHERIC CONTAMINATION IN SEALAB I. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces; 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th) Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-210, p. 296-305, Nov. 1965.
CFSTI, DDC: AD 626622

The Man-in-Sea Program has several important goals, one of which is to make possible the free movement of scuba divers for extended periods of time at depths up to 1000 feet. Present practical dives are limited to a few hundred feet for useful work periods measured only in minutes. More importantly, hours of time may be required after such dives to return the divers safely to the surface. Techniques now being investigated by the Navy, however, are designed to permit divers to work at depths of hundreds of feet for 6 to 8 hours a day, day after day, without the necessity for intervening returns to the surface. Such long dives will permit exploration of large areas of the undersea continental shelf, areas which abound in mineral and food riches. Diving explorations of this magnitude are made possible by eliminating the long decompression periods required for returning divers to the surface. This is accomplished by providing the divers with undersea living accommodations which they may enter or leave at will. After working in the open sea the divers have only to re-enter their undersea home to rest and refresh themselves. They will be able to live comfortably in these quarters for months

at a time, secure from their hostile outer environment. The first U. S. Navy open sea tests of these new concepts were made in the summer of 1965 at Argus Island, a Texas Tower off the coast of Bermuda. The diverse submerged living quarters was called SEALAB I. A description of the facility is presented and methods of analyzing contaminants are discussed. Reference is made to nuclear submarine atmospheres and methods for studying atmospheric contaminants are discussed.##

01866

J. H. Farmer J. D. Williams

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. III. AIR QUALITY MEASUREMENTS. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, Dec. 1966. 190 pp.

The development of an effective air resource management program begins with identification of the pollutants in the air, and determination of the quantity and origin of each type. The air quality measurement program was designed and operated to make these determinations in the Metropolitan St. Louis area. Once the physical aspects of the air pollution problem are defined, air-pollution-effect data and criteria as well as opinion surveys can be used to set the air quality goals. From this base, with use of the pollutants emission inventory the air resource management emission control plan can be designed. At this stage the air quality measurement program is used to monitor the air quality to assure that the goals are attained. In addition to its use in the air resource management program, this report provides a reasonably complete list of air quality data in a form that will assist research and program personnel in developing activities and attaining program objectives. A population distribution map of the study area is provided to allow comparison between distribution of population, pollutants, and sampling measurement networks.##

01929

V. A. Trel'yakova

THE DETERMINATION OF 4,4'DIPHENYLMETHANE DIISOCYANATE IN AIR UNDER EXPERIMENTAL CONDITIONS. Gig. Sanit. 31, (4-6) 73-5, Apr.-June 1966. 8t. (Tr.)
CFSTI, TT 66-51160/4-6

Two methods are suggested for the photometric determination of 4,4-diphenylmethane diisocyanate (DMD). The first method of determination is based on the reaction of DMD with aromatic amines and nitrites for which the sensitivity is 1 microgram in 4.2 ml and the determination error is plus or minus 7%. The second method of determination is based on the reduction of DMD with NO2 ion. In this case the sensitivity is 20 micrograms/5.5 ml for photometric determination with an FMS-56 instrument, with a mean error of plus or minus 4%; the sensitivity for photometric determinations by the standard series method is 2 micrograms/5.5 ml, with an error of plus or minus 10%. DMD vapor is absorbed by acetone when the air is drawn through two absorbing vessels with porous partitions cooled by ice, at a rate of up to 30 l/hr.##

04929

F. G. Rachaut

DETERMINATION OF DIMETHYLAMINOAZOBENZENE IN AIR. Hyg. Sanit. 31, (4-6) 235-5, Apr.-June 1966. Russ (Tr.)
CFSTI, TT 66-51160/4-6

Dimethylaminoazobenzene is a basic azo dye and is used for staining ethyl liquid (antiknock). During the manufacture of this compound, its aerosol pollutes the air of the factory shops. Therefore it was necessary to devise a method for its determination in air. The reaction proposed by Selins for the investigation of another azo compound, viz. o-aminoazotoluene was utilized. The method is based on the reaction of azo compounds with acids, with the formation of colored solution. It was found that the highest sensitivity (0.2 microgram) was achieved by adding 0.2 ml of 15% HCl solution to 2 ml of alcohol solution of dimethylaminoazobenzene.##

04937

O. G. Meromskii

PHOTOELECTROCOLORIMETRIC DETERMINATION OF HIGHER ALIPHATIC AMINES IN AIR. Hyg. Sanit. 31, (4-6) 381-3, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

The present method was developed for the investigation of air with respect to enrichment of potassium salts in which the flotation agent is represented by aliphatic amines (C16-C20) in the hydrochloride form which are markedly toxic. There is no established maximum permissible concentration for higher aliphatic amines in factories and in the atmospheric air. The method is based on studies of amines in aqueous solutions. The determination is based on the reactions of amines with methyl orange at a pH of 3.0-5.0, forming a yellow compound which is readily soluble in organic solvents (dichloromethane, chloroform). The sensitivity is 1 microgram in the analytical volume in the case of octadecylamine. Ammonia does not interfere. The accuracy of the method (99.8-100%) practically corresponds to the accuracy of the instrument in the interval of 5 to 100 micrograms. Addition of 25 micrograms of a mixture of KCl plus NaCl in the ratio in which they are present in potassium concentrate does not affect the sensitivity and the accuracy of the determination. The method was used in studies of air pollution by amines at the ore-dressing factory of the 1st Soligorsk Potassium Works. Amines were discovered in all air samples, in concentrations of 0.001 to 0.09 mg/cu m.##

04938

G. I. Nenaina

SPECTROPHOTOMETRIC DETERMINATION OF FURFURAL IN AIR. Hyg. Sanit. 31, (4-6) 383-5, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

The use of modern construction materials involves the danger of liberation of toxic substances into the air of the living rooms. A laboratory investigation of samples of chipboard which were subsequently treated with FA monomer (mixture of furfural and acetone) was made. In addition to he chemical methods (Alekseeva) for the determination of furfural concentrations in air, absorption spectroscopy in the ultraviolet spectrum region was used. The spectrophotometric measurements resulted in the determination of the absorption maximum for furfural and produced its spectral pattern. According to the findings, the determination of furfural can be performed within a period of 20 min to 5 days from the moment of the taking of air samples. The air is drawn through a Y-shaped absorption vessel containing 5 ml ethanol at a rate of 0.5 l/m for 20 to 30 min. The spectral patterns of formaldehyde in ethanol containing 0.1 and 0.01 mg/ml were demonstrated. Formaldehyde did not interfere with the determination of furfural. Acetone likewise causes no interference. Interference is caused by the presence of phenol. However, the absorption maximum of phenol is considerably higher and the method described can be used for the investigation of furfural in the presence of formaldehyde and acetone and in the absence of phenol.##

OIVUO

A. S. Filatova, A. I. Kuz'minykh, F. D. Vedernikova, N. S. Solomennikova

DETERMINATION OF 3,4-BENZPYRENE LIBERATED BY SUBLIMATION OF ANODE MATERIAL IN ELECTROLYTIC SHOPS OF ALUMINUM PLANTS.
Gig. Sanit., 31, (4-6) 101-4, Apr.-June 1966. Russ. (Pt.)
CFSTI, TT 66-51160/4-6

An investigation of the group of neutral multinuclear cyclic hydrocarbons with the intention of subsequent isolation and quantitative determination of 3,4-benzpyrene which is the most actively carcinogenic hydrocarbon was undertaken. Samples at the electrolytic shop of an aluminum plant of dust from the anode, from the inlet connector of the cell, from the anode pin and from the "fog" evolving from under the pins as well as at the position occupied by the operator were taken. Air was drawn at a rate of 10 l/min through a filter made of the PPP-15 fabric fixed on a steel funnel, taking larger volumes of air in order to concentrate the small quantities of 3,4-benzpyrene assumed to be present. Since the carrier of carcinogenic substances is represented by tarry substances, the dust samples were extracted in a Soxhlet apparatus and quantitative determinations were made of the yield of tarry substances. Nonfluorescent benzene was used as the solvent. From the complex mixture of tarry substances by 3,4-benzpyrene was isolated by partition paper chromatography and fluorescence. The contents of 3,4-benzpyrene in the air samples taken in the electrolytic shop of an aluminum plant were as follows: 0.0137 to 0.022 1 microgram/l at the worksite, 0.0361 to 0.2250 microgram/l during the removal of the pins and 0.0519 to 1.1200 microgram/l in the "fog" issuing from under the anode pins.##

01949

R. Jaitan

ABSORPTION OF POLAR SUBSTANCES ON THE SOLID SUPPORT OF COLUMN PACKING IN GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF AIR CONTAMINANTS. J. Chromatog. 29, (2) 502-3, Oct. 1966.

The phenomenon of the adsorption of polar substances on the solid support of nonpolar columns may be used in the qualitative analysis of air contaminants. When this analysis is performed on both polar and nonpolar packed columns very probably polar substances will not be detected on nonpolar packed columns.##

01955

M. Caruana and S. Bonet

EVALUATION OF POLYNUCLEAR HYDROCARBONS IN CIGARETTE SMOKE BY GLASS CAPILLARY COLUMNS. J. Gas Chromatog. 5, (2) 101-5, Feb. 1967.

The detection and identification of polycyclic hydrocarbons in cigarette smoke, airborne particles, and petroleum waxes by gas chromatography with flame ionization detector or electron capture detector is reported. The use of capillary columns affords the opportunity of separating a large number of polynuclear hydrocarbons from complex mixtures. A large number of cigarettes were used for the gas chromatographic analyses. Solutions with polynuclear hydrocarbons in high concentrations were need, as samples introduced in capillary columns must be small for good resolution of the peaks.##

01965

R. J. Bolduc and R. R. Severs

A MODIFIED TOTAL COMBUSTION ANALYZER FOR USE IN SOURCE TESTING AIR POLLUTION. Air Eng. 7, (8) 28-9, Aug. 1965. (Presented before the Division of Water, Air, and Waste Chemistry, 149th National Meeting, American Chemical Society, Detroit, Mich., Apr. 4-9, 1965.)

The development of a Total Combustion Analyzer (TCA) for portable, on-site sampling and analysis of combustion gases for hydrocarbon, carbon monoxide, and carbon dioxide concentrations is described. The TCA was tested in comparison with the Flame Ionization Analyzer and Detector at three industrial sources. The data collected show the TCA unit to be reliable, accurate and capable of on-site use.##

03967

R. S. Brazan

FLAME EMISSION AND DUAL FLAME EMISSION-FLAME IONIZATION DETECTORS FOR GAS CHROMATOGRAPHY. Anal. Chem. 38, (6) 734-42, May 1966.

A hydrogen-air flame emission detector was constructed employing interference filters and standard gas chromatography instrumentation. Instrumentation variables were studied. Detection sensitivity was in the microgram range, wavelength dependent and generally greatest for heteroatom - containing compounds. The study of emission response at 589, 516, and 415 millimicrons indicates that the emission intensity attributed to C2 or CH molecules in the flame plasma are dependent upon the structure of the chromatographed compounds. The design and operation of a dual flame emission-flame ionization (FE/FI) detector for gas chromatography is also described. The influence of structure on response ratios was studied on a chlorinated methane series of compounds, an aromatic series of compounds, and a three-carbon series of compounds. The influence of structure on response ratios was demonstrated thus establishing the potential use of the dual detector in qualitative identification of peaks. (Author abstract)##

03971

R. G. Confer and R. S. Brief

MYLAR BAGS USED TO COLLECT AIR SAMPLES IN THE FIELD FOR LABORATORY ANALYSIS. Air Eng. 7, (10) 34-6, 1965.

Mylar plastic bags, as a means of sample collection, were studied to determine bag conditioning effects and decay rates at accepted threshold limit concentrations and to establish a method of sampling. Industrial solvents were of particular interest in the study. It was determined that bag conditioning is necessary to insure that sampled air represents workroom air contaminant concentrations. Samples collected remained at or above 90% of the initial airborne concentration for several days for some materials.##

03977

R. J. McEwen

AUTOMOBILE EXHAUST HYDROCARBON ANALYSIS BY GAS CHROMATOGRAPHY. Anal. Chem. 38, (8) 1097-51, July 1966.

A new gas chromatographic method has been developed to analyze the complete range of hydrocarbons in both raw and highly diluted automobile exhaust gas. A commercial gas chromatograph was modified to include a separate oven for thermostating a gas sampling valve and a flow - switching valve, a subtractor

column for resolving the unsaturated hydrocarbons, and an adsorption column in dual arrangement with a capillary column. Sampling of exhaust gas and hydrocarbon calibration mixtures was investigated. The capabilities of the method are demonstrated with examples of analyses of exhaust gas from different engine operating modes.##

03691

G. G. Esposito R. H. Evans

DETERMINATION OF AROMATIC CONTENT OF HYDROCARBON PAINT SOLVENTS BY GAS CHROMATOGRAPHY. J. PAINT TECHNOL. 38, (498) 377-80, July 1966.

The solvency characteristics of petroleum thinners for alkyd resins can be related to the amount of aromatic hydrocarbons present. Many other synthetic resins require thinners of high aromatic content and there is a need for a rapid, accurate analytical method that can be used for quality control. A procedure is described for the determination of aromatic solvents in petroleum thinners by gas-liquid chromatography (GLC) using a highly selective partitioning liquid. (Author abstract)##

04018

B. Bandis

(ON THE VOLATILITY OF POLYCYCLIC HYDROCARBONS.) SUR LA VOLATILITE DES HYDROCARBURES POLYCYCLIQUES . Intern. J. Air Water Pollution 9, (3) 113-21, Mar. 1965. Fr.

Despite the high boiling point of hydrocarbons, certain polycyclics volatilize rapidly due to air currents with little change in ordinary temperature. It is probable that such products are disseminated from industrial establishments where solid fuel (charcoal) is used. In air pollution sampling, the concentration of particulate polycyclic compounds is estimated by collection of suspended matter on glass or paper filters. This method introduces errors into the results because of evaporation, especially for those compounds which have particularly low melting points. Particle size, volume and temperature of the air flowing through the factors during sampling should be considered as important parameters in this type of sampling. Oxidation of samples during storage is also a possibility to consider.##

04029

E. Sawicki, C. R. Engel, and M. C. Elbert

CHROMATOGRAPHIC LOCATION AND COLORIMETRIC DETERMINATION OF MERCAPTANS, PROLINES AND FREE RADICAL PRECURSORS . Talanta, Vol. 14, p. 1169-1178, 1967. 19 refs.

A new reagent is introduced for the colorimetric determination of free radical precursors, such as cysteine, proline, hydroxyproline, the phenothazine family, and mercaptans. 7,7,8,8-tetracyanoquinodimethan (TCNQ) is also useful in the location and characterization on paper or thin-layer chromatograms of proline, hydroxyproline, cysteine, polynuclear compounds, mercaptans, thiocarbonyl amides, and thiosemicarbazones. In addition, amino acid derivatives, such as the N-(phenylthiocarbamyl) amino acids and the 5-phenylthiohydantoins, can be located and characterized on chromatograms. TCNQ has been applied to the location and characterization of atmospheric proline, carbazole, and 11 H-benzo(a)carbazole. For characterization purposes absorption spectra were obtained directly from glass-fiber, paper, or thin-layer chromatograms from about 300 to 900 millimicron. (authors' abstract)##

03966

R. J. Roldus, R. R. Severns, and G. L. Brewer

TEST PROCEDURES FOR EVALUATION OF INDUSTRIAL FUME CONVERTERS (SAMPLING AND ANALYTICAL TECHNIQUES REVIEWED FOR). Air Eng. 8, (2) 20-3, Feb. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

The purpose for development of the source testing outline was to permit systematic evaluation of air pollution control equipment on gaseous organic fume streams. Data were obtained to fulfill the following objectives of the source outlines: (1) Determination of combustible emission and conversion efficiency. (2) Determination of particulate matter emissions. (3) Identification of specific emissions by laboratory analyses. (4) Determination of the odor concentration of the effluent stream in conjunction with these objectives of source test measurements, the outlined program was to include: (5) A method to check credibility of sampling and analyses. (6) A technique for future monitoring of the control equipment performance. Source tests were conducted on catalytic fume converter units located on a metal-coating oven, a varnish-cooking kettle, a phthalic anhydride plant and a wire-coating oven. Sampling procedures, analytical techniques and developed equipment are discussed. The results of each of the evaluations of the catalytic fume converters are presented.##

04049

R. A. Duffee, E. J. Schuls, and E. W. Unger

DISTURBING FACTORS IN PARTICULATE SAMPLING. Preprint. (Presented at the Third Conference on Applied Meteorology, Santa Barbara, Calif., Apr. 5-8, 1960.)

The study reported in this paper, which was carried out in the course of developing a tracer technique for industrial emissions,

was designed to measure the magnitude of the errors resulting from anisokinetic sampling in the atmosphere and the effects of deposition on the filter. Uranine dye, a fluorescent pigment, was utilized as the sample particulate in all the experimental studies. A 10% water-uranine solution was prepared and sprayed from two pneumatic nozzles, with liquid and atomizing air pressures of 80 psig. The water evaporated quickly, leaving dry uranine particles with mass median diameters of 6 and 12 microns as measured by a cascade impactor. Sample analysis consisted of dissolving the dry sample in 20 ml of distilled water and reading the fluorescence on a fluorescent meter. These studies indicate that, for particles with Stokes diameters greater than 10 microns, the error in mass concentration resulting from neglect of deposition may be a factor of two. For particles with Stokes diameters less than 10 microns, this error appears negligible. The effect of variations in sampling velocity on sample concentration, for the range of sampling velocities used in these runs, indicates that a sixfold increase in sampling velocity results in a doubling of the sample concentration. However, in one case, a ninefold increase in sampling velocity resulted in only a 15% increase in sample concentration, and, in another instance, a sixfold increase in sampling velocity resulted in an increase in the sample concentration by a factor of four. The results of these studies serve only to identify some of the potential errors, and their relative magnitudes, involved in the sampling of atmospheric particulates. Differences in the results of the wind-tunnel and atmospheric tests indicate the difficulties involved in measuring true mass concentration in the atmosphere. Perhaps of more importance is the fact that these results point out the dangers inherent in using a measure of one physical property, such as mass concentration, to predict another, such as deposition rates, in a turbulent atmosphere.##

09051

D. Bondia

TESTS TO ESTABLISH ADEQUATE CRITERIA FOR THE HARMFULNESS OF ATMOSPHERIC POLLUTANTS AND SUGGESTIONS FOR A CAMPAIGN TO COMBAT AIR POLLUTION. Essais de mise au point d'un Critere Adequate de Nocivite des Polluants Atmospheriques et Suggestions sur une Campagne de Lutte Contre la Pollution. Preprint. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 8-12, 1961.)

In establishing the health hazards of polluted air the measurement of reflection and light transmission of smoke samples is inadequate for two reasons. The first is technological and is due to the insufficient validity of the methods used; the second is biological and is due to the lack of relation between the toxicity of the smokes which contaminate air and their weight as obtained by the sampling. A fluorometric approach to this problem was investigated and it was found that in the particular industrial area in which the study was made there are seasonal factors that would have to be taken into consideration, particularly during the summer, in order to establish a reliable system for pollution measurement. Air pollution programs should establish priorities in their approach to the general problem, giving first priority to toxic contaminants, after which the disagreeable pollutants from a psychological or economic standpoint could be dealt with.##

04064

M. V. Alekseeva, N. A. Kryiova, and V. A. Khrustaleva

SPECTROPHOTOMETRIC DETERMINATION OF BENZENE, ISOPROPYLBENZENE, AND ALPHA-METHYLSTYROL IN THE AIR. Gigiena i Sanit. 28, (1) 11-6, Jan. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The following two problems were investigated: (1) determination of small amounts of benzene, isopropylbenzene and alpha-Methylstyrol in the air, and (2) selection of a solvent medium for the collection of samples of the above substances, which might make possible the quantitative determination of the substances. In this connection the spectrophotometric method is based on the determination of the optical density of the investigated substance in solution at wave length corresponding to its maximum absorption. An essential requisite of this method is that the investigated substance must behave in the selected solution in accordance with Beer's law. Ethanol was finally selected as the solvent in the study here described using spectrophotometer SF-4.##

04065

P. A. Krotkov, M. M. Serebrantova, and V. B. Timofeev

A PHOTOELECTROMETRIC METHOD FOR THE DETERMINATION OF LOW 3, 4-BENZPYRENE CONCENTRATIONS. Gigiena i Sanit. 28, (5) 47-9, May 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The report published by P. P. Dikun in 1961 contains a quantitative spectrophotometric method for the determination of low 3, 4-benzpyrene concentrations. The sensitivity of the method makes possible the determination of 10 to the minus 8th power micron of 3,4-benzpyrene in 1 ml of solution. The quantitative analytical procedure previously recommended by the same author which was based on fluorescent 3,4-benzpyrene spectra at low temperatures and on the use of a photometer as described by F. Weigert in 1934; V. S. Prokof'ev, 1951; by that procedure 1,12-benzperylene was used as the inside standard. The spectra were recorded photographically. The present authors increase the method sensitivity and rapidity by recording spectral intensities photoelectrically.##

04066

G. S. Saiyasov

COLORIMETRIC METHOD FOR TOTAL ALKYL AMINES DETERMINATION. Gigiena i Sanit. 28, (5) 50-1, May 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The following reagents are used in determining amines in the air: 1) Ammonia-free distilled water; remove ammonia and acid by boiling the distilled water for 1-1/2 to 2 hours; keep in a bottle with a stopper through which insert an absorber tube containing activated charcoal and ascarite; store so as to prevent contact with air containing ammonia or acid vapor; 2) 0.1% solution of o-nitrophenol prepared at 40-50 degrees with intermittent stirring ; 3) Nessler-Folin solution, prepared from potassium iodide, iodine, mercury, and alkali, as described by D. T. You in 1935; 4) Standard 0.1 millimolar (0.1 micro mole/ml) solutions of aliphatic amine and ammonia, prepared by hundredfold dilution of 0.01 N stock solutions, using ammonia-free water; check by titrating 100 ml of the 0.01 N amine solution with a standard 0.1N HCl solution using methyl red as the indicator; 5) Ascarite granular 2-4 mm in diameter. Concentrations of amines in the air was computed on the basis of total bases minus ammonia concentration. The value of K/1000, in the case of methyl amine is 0.011; for dimethyl or ethyl amine it is 0.045, and for triethyl amine, 0.101. The method is accurate to 0.02 micro mole in the colorimetrically analyzed volume; for methyl amines and ethyl amine it corresponds to about 1 gamma, for di- and tri-ethylamine 2 gamma, and for ammonia 0.4 gamma per sample volume. The method was applied in practice and yielded satisfactory results in determining content of aliphatic amines in the air of working premises and in experimental animal exposure chambers.##

00099

M. I. Polotsev

COLORIMETRIC METHOD FOR THE DETERMINATION OF MONOISOPROPYLDIPHENYL IN THE AIR. Gigiena i Sanit. 28, (8) 40-1, Aug. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The purpose is to report on attempts to develop a method for the determination of MIPD (Monoisopropylidiphenyl) in the air of working premises. This author used the method based on the colorimetric determination of MIPD by the Yanovskii reaction. Air samples were collected by the aspiration method using the Polezhaev microabsorber which contained 1 ml of a nitro mixture consisting of 10 g of ammonium nitrate in 100 ml of sulfuric acid of 1.82-1.84 sp. gr.; the air was aspirated through this medium at the rate of 0.2-0.4 l/min. Where the concentration of MIPD is suspected to be high, air samples can be collected by the vacuum method into special containers of 100-200 ml capacity. Two ml of the nitro mixture is added to the air sample containing vessel, and let stand for 1 hour periodically washing the walls of the sample container with the nitro mixture. The minimal amount of MIPD determined by the acetone-alkaline medium extraction was 1 microns in colorimetric volume, and by the ether extraction in acid medium, the minimum was 2 microns. In the presence of other aromatic substances, the method is nonspecific.##

04102

N. V. Lindval and I. V. Yermakova

ACETYLENE DETERMINATION IN THE AIR BY INFRARED SPECTROSCOPY.
Gigiena i Sanit. 28, (9) 51-4, Sept. 1963. Russ. (Tr.)
(Translated by B. S. Levine in U.S.S.R. Literature on
Air Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: TT 66 61429

Acetylene vapor is present in the air of working premises in the production of calcium carbide, in the air of acetylene stations and of plants which use acetylene in their production processes. No maximal permissible concentration of acetylene vapor in the air has as yet been established. A colorimetric method for the determination of acetylene in the air was previously developed. Determination of very low concentrations of acetylene vapor in the air by this method required the collection of large volume air samples, which is time consuming. In addition different samples are characterized by different color shades which makes precise determination at times difficult, if not impossible. By the method described it is possible to determine minute quantities of acetylene in the air with the aid of infrared microscopy. Data presented show that the colorimetric method yielded some-what lower results than the spectral method. A method was described for the quantitative determination of low acetylene concentrations in the air; it was developed on the basis of infrared spectrophotometry and is sufficiently sensitive to determine acetylene vapor in the air within the limits of 0.002-0.5% by volume.##

04161

F. Iritani and T. Morishita

QUANTITATIVE DETERMINATION OF BENZENE TOLUENE, AND XYLENE IN SOLVENT AND IN AIR BY GAS-CHROMATOGRAPHY. Japan. J. Ind. Health (Tokyo) 2, (6) 56-67, June 1960. Jap.

The minimum determinable concentration of benzene, toluene, and xylene in solvents was found with gas chromatography to be 0.1% and the error was within 0.5% of the value determined. The quantitative determination of benzene, toluene, and xylene in air using colorimetry after separation by gas chromatography showed gross error and is of no practical use, because the vapors condensed near the outlet. When the air was supplied to the gas chromatograph without preparation, the minimum determinable value was about 75ppm for 10 ml of air, but 75ppm is too high to be a desirable minimum value. To concentrate the air then, 1 liter of air was passed at the rate of 100 ml/min through a small column filled with 1 g of solid support (DOP) and cooled by dry ice; when the gases are attached to the inlet of the gas chromatograph and heated to 110 degrees C, a satisfactory gas chromatogram is obtained. When the vapor determination is made in air, the adequate column temperature is 100 degrees C instead of 145 degrees C (as with the analysis with solvents), since at 145 degrees C the vapors are not separated sufficiently from steam. In order to prevent disturbance by steam, phosphorus pentoxide must be put around the concentration column during air-sampling. Silica gel and a molecular sieve are inadequate as desiccating agents since they absorb benzene, toluene, and xylene

as well as steam. This method proved reliable when air samples containing known quantities of the vapors were analyzed. The minimum determinable concentration by this method using 1 liter of air is approximately 2ppm for benzene, 4ppm for toluene, and 10ppm for xylene, and these are equivalent to about 0.001mV (4mm) in the peak height of gas chromatograms. Measurements can be taken in the field if the samples are taken into concentration columns with phosphorus pentoxide columns and tightly corked. (Author summary modified)##

08199

H. Konosu

DETERMINATION OF ORGANIC SUBSTANCE VAPOR-AIR MIXTURES BY A NON-DISPERSIVE ULTRAVIOLET GAS ANALYZER. Gov. Chem. Ind. Res. Inst., Tokyo 62, (1) 25-31, Jan. 1967. Jap.

Vapors from organic substances used in chemical processes may have hazardous levels of toxicity or explosibility. A nondispersive ultraviolet gas analyzer, a device for determining the concentration of an ultraviolet-absorbing component in a nonabsorbing mixture of gases, has been developed and applied to toxic or explosive gases. The samples were HCOOCH3, HCOOC2H5, CH3COOCH3, CH3COOC2H5, CH3CH2Br, (C2H5)2NH, and CH3CH2CH2CH2NH2. The concentrations of the gases in air were determined from calibration curves plotted as absorbance vs. vol%. The analyzer could operate over a wide concentration range from 6 ppm for (C2H5)2NH to 6 vol% for HCOOCH3. The coefficients of variation of analysis (per cent transmission) were 0.02% and 0.016% for the concentration levels of 117 ppm and 2.7% vol% HCOOCH2H5, respectively. Time required for an individual determination was 1 min or less. (Author summary)##

08206

T. Matsumura and F. Suda

GAS CHROMATOGRAPHIC ANALYSIS OF ATMOSPHERIC POLLUTANTS IN INDUSTRIES. Bull. Natl. Inst. Ind. Health (Kawasaki, Japan) 6, 46-51, 1960.

A description is given of the sampling efficiency of six kinds of sampling bottles used for absorbing organic vapors where the sampling solution is analyzed quantitatively by gas chromatography. Toluene was used as the sampling solvent and benzene as the organic vapor. A sampling solution was fed into the chromatograph and the benzene and toluene peaks recorded. Benzene sampling efficiencies were then determined and various factors affecting efficiency discussed. It was found that bottles having the best efficiencies are long midget impingers with glass beads at the bottom. The results of field measurements of methanol, ethyl acetate, benzene, and xylene in a dyeing factory are presented.##

04210T

METHODS OF MEASURING AIR POLLUTION. MEASUREMENT OF HYDROCARBONS. (PART 5.) Misura delle Idrocarburi (Parte 5). Fumi Polveri (Milan) 6, (12) 111-6, Dec. 1966. It.

Polycyclic hydrocarbons, present in the air as an integral part of the material in suspension, and volatile hydrocarbons present in the gaseous state, were investigated as pollutants. Polycyclic hydrocarbons can cause cancer. Work on the "anthracene index" and the "method of quinine sulfate" made it possible to define a simple index of the tar material, whether this index could or could not be related to the concentration of individual polycyclic hydrocarbons. Good results for determining the smoke content of tars are possible if contamination by other pollutants, such as lubricating oil, is avoided. The "method of quinine sulfate" can be correlated with the daily measurements of smoke/SO2 being carried out in various locations. Volatile hydrocarbon pollutants are becoming more prevalent in large cities due to automotive emissions. The principle of the index of the quinine sulfate method is described using fluorometric measurements on the sample and on a reference.##

04219

BENZENE; TOLUENE AND XYLENE; STYRENE (METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR). Ministry of Labour, London, England. (Booklet No. 8.) 1966. 12pp.

This booklet is one of a series describing chemical methods involving color changes to be used to give a rapid indication of the atmospheric hazard where the primary object is not extreme accuracy. For benzene in the presence of toluene, xylene, and styrene, the toluene and xylene are removed by absorption in a solution of selenous acid in sulfuric acid. The benzene is then determined from the color produced in concentrated sulfuric acid containing paraformaldehyde which is compared with a range of color standards. Toluene, xylene, and ethyl benzene up to 300 ppm and styrene up to 170 ppm do not interfere. Toluene and xylene are determined by comparing the yellow color produced with a sulfuric acid solution of potassium iodate with a range of standard colors. Styrene and ethyl benzene react like toluene and xylene. For styrene, the color with concentrated sulfuric acid is compared with a range of standard colors. Vinyl styrene reacts like styrene. Acetone (500 ppm) and ethyl methyl ketone (200 ppm) reduce the color produced by 100 ppm of styrene by 20% and 10% respectively.##

04248

F. F. Algina and Z. G. Mints

DETERMINATION OF LOW 3,4 BENZPYRENE CONCENTRATIONS BY MEANS OF THE LUMINESCENT EFFECT. (O opredelenii malykh kontsentratsiy

opredelenii malykh kontsentratsii 3, 4-benzpirena s pomoshch'yu effekta Shpol'skogo.) Hyg. Sanit. 31, (8) 264-7-, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

The use of quasilinear fluorescence spectra for the quantitative determination of 3,4-benzpyrene is said to increase the sensitivity by 2 or 3 orders of magnitude in comparison to the spectrophotometric method. The known procedures suffer from several disadvantages. The purpose of the present work was the development of a better procedure. A new procedure was devised for the quantitative determination of 3,4-benzpyrene without an internal standard, by using the mercury line of wavelength 190.6 nm (1906 A) as the reference line, and the advantage of using this line was demonstrated. The range of determinable concentrations lies between 0.002 and 0.05 micrograa/ml. The relative standard deviation for a single analysis is 26%. A cruder qualitative determination of 3,4-benzpyrene is also possible for lower concentrations of this substance. The new procedure ensures a higher sensitivity than Dikun's procedure (approximately by one order of magnitude) and moreover is considerably simpler, more readily available, and less labor consuming. A procedure was devised for a quantitative determination of 1, 12-benzperylene in the concentration range of 0.02-2 micrograa/ml. The relative standard deviation is 16%.##

04258

A. T. Toupikov, and A. I. Grigorenko

RAPID METHODS FOR THE DETERMINATION OF TERTIARY FATTY ALCOHOLS, LOWER KETONES AND XYLENES IN AIR. ((Bystrye metody opredeleniya tretichnykh zhirnykh spirtov, nizshikh ketonov i ksilolov v vozdukhe.)) Hyg. Sanit. 31(9):318-321, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

The method for determination of tertiary fatty alcohols and lower ketones is based on adsorption of vapors of these substances on silica gel, followed by acid-thermal condensation with vanillin to obtain colored reaction products. The reaction consists of an acid-thermal condensation on silica gel of vanillin as a reagent with active methylene alkyls that are directly bound with the C-OH group in tertiary alcohols or with the CO group in ketones. The intermediate reactions produce unsaturated hydroxy ketones or alcohols resembling coeruains in their chemical structure; these substances are converted to dyes of a complex composition by the acid-thermal factor. The procedure is as follows: A thin short length of rubber tubing is attached to the syringe of the air-sampling device. The narrow end of the tube with silica gel (which is open at both ends) is connected to the air-sampling device and a measured volume of air is pumped through. The tube is disconnected, 4 or 5 drops of the solution of vanillin-sulfuric acid are introduced and the tube is shaken until the silica gel is completely impregnated. The silica gel layer is then heated in a flame. On cooling, the length of the colored silica gel layer is measured. A blank test is performed in parallel, without the pumping through of air. The concentration of substances in the measured volume of air passed through the silica gel is found by means of a graph, in which the

length of the colored silica gel layer is marked on the x-axis (in millimeters), while the concentrations (milligrams) are marked on the y-axis. The concentration is converted to milligrams per liter by means of the formula: X=a.1000/b, where X is the concentration of the substance in question (mg/l), a is the concentration of the substance in the volume of air passed through the tube (mg), and b is the volume of air (ml). The method for determination of commercial xylene is based on the production of red-colored salts by the reaction of xylenes with protropinsulfuric acid on silica gel.##

04255

M. S. Nykhovskaya and R. N. Makedonskaya

DETERMINATION OF ALIPHATIC AMINES IN AIR. [K metodike opredeleniya alifaticheskikh aminov v vozdukhe.] Hyg. Sanit. 31, (9) 421-425, Aug. 1966. Russ. (Tr.)
CFSTI: T 66-55160/7-9

In studies of the primary aliphatic amines, optimum conditions were studied for their determination with ninhydrin, potassium 1, 2-naphthoquinone-4-sulfonate and p-nitrophenyldiazonium. The best reproducibility was achieved in an aqueous-pyridine solution with the addition of a little ascorbic acid. The reaction product imparts a blue-violet color to the solution, as distinguished from the control solution which displays a pinkish-violet color. The maximum light absorption of the solution occurs at the wavelength of 575 mA. The sensitivity is 1 microgram in the volume analyzed. In the concentration range of 1 to 10 micrograms there is a linear relationship between the optical density and the amine concentration in solution. No interference is caused by secondary and tertiary aliphatic amines or by aromatic amines. Any ammonia interferes with the determination, because its presence in the sample to the extent of 1 microgram colors the solution an intense blue-violet. The most selective reaction for the determination of secondary amines is based on the formation of copper dialkyldithiocarbamate. Where an air sample is taken in ethanol, and 0.1 ml of 15% alcohol solution of CS_2, 0.1 ml of 0.1% alcohol solution of copper acetate and 0.1 ml alcohol solution of KOH are added to the 2-ml sample. The addition of each reagent is followed by mixing of the solution. After 10 min, the intensity of the colored sample is compared against the standard scales, or else the optical density of the solution is measured in a cell. A method for the determination of trimethylamine in air using a citric acid solution in acetic anhydride was developed. Reactions with citric acid and acetic anhydride as well as those with phosphotungstic or phosphomolybdic acids may also be applied to studies of several tertiary amines, no interference being caused by secondary and (other) tertiary amines.##

04262

J. O. Adams, J. P. Conkle, W. F. Hanson, J. F. Watson, P. H. Wolf, and B. E. Welch

STUDY OF MAN DURING A 56-DAY EXPOSURE TO AN OXYGEN-HELIUM ATMOSPHERE AT 258 MM. HG TOTAL PRESSURE. II. MAJOR AND MINOR ATMOSPHERIC COMPONENTS. Aerospace Med. 37,(6) 556-8, June 1966.
CFSTI: AD 641819, DDC

The atmosphere to which four human volunteers were exposed for 56 days during a study designed to describe the effects of oxygen-helium on man was analyzed for major and minor constituents. The partial pressure of the major constituents, oxygen (175.2 plus or minus 2.9 mm. Hg) and helium (73.9 plus or minus 2.1 mm. Hg), remained within the established experimental parameters. Sixty-eight minor constituents were detected. The concentration of these compounds remained below a level thought to cause a physiologic effect. The instrumental methods employed were sufficient for a comprehensive anayisis of the synthetic atmosphere. (Author abstract)##

0418

A. J. Hocker, W. G. Yaten, P. R. Ray, and R. P. Sweeney

CERTIFICATION OF AUTOMOTIVE EXHAUST EMISSION LABORATORIES BY CROSS CHECKS OF THE ANALYTICAL INSTRUMENTS. Instr. Soc. Am., Conf. Preprint, 1965.

Implementation of the California law on auto exhaust emissions required the active participation of laboratory facilities of the industry in determining emission levels of their products. The law authorizes the certification of laboratories. This paper discusses the methods used by the State of California at its official laboratory in testing automotive exhaust emissions and the techniques employed and results of typical cross check pre-certification tests which were conducted to insure that the California motorist will receive 1966 model automobiles that comply with the legal standards. As a result of such work, fourteen private industrial laboratories have been so certified. These companies include six American automobile manufacturers. Similarly equipped and instrumented laboratories in various locations can duplicate the results obtained by another facility; similar instruments if exposed to the same concentration of contaminants will yield the same results. The technical community has demonstrated the ability to evaluate exhaust emissions in different test laboratories with the same results.##

0419

E. Sawicki, H. Guyer, and C. R. Engel

PAPER AND THIN-LAYER ELECTROPHORETIC SEPARATIONS OF POLYNUCLEAR AND HETEROCYCLIC COMPOUNDS. Preprint, 1967.

A large number of polynuclear and heterocyclic compounds have been separated by paper and thin-layer electrophoresis. The phetograms were scanned fluorimetrically. Many of the separated

compounds were capable of being characterized and assayed by the scanning procedure. Analysis by fluorimetric scanning of the phenograms was much more selective when the appropriate excitation and emission wavelengths were used. Samples of urban airborne particulate can be separated and analyzed with the help of paper or thin-layer electrophoresis. (Author abstract)##

04129

T. W. Stanley, M. J. Morgan, and J. E. Meeker

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND SPECTROPHOTOMETRIC DETERMINATION OF BENZO(A)PYRENE IN ORGANIC EXTRACTS OF AIR-BORNE PARTICULATES. Preprint, 1967.

A modification of a recently reported procedure by Sawicki, et al, for thin layer separation and spectrophotometric determination of benzo(a)pyrene is reported. Modified procedures are discussed and compared with other methods, and the data obtained by different technicians are reported. Procedures involved the spotting of a 0.5-to-5-mg aliquot of a dichloromethane solution of organic residue of air particulates from the bottom of a thin-layer plate. A 2-microgram aliquot of a dichloromethane solution of pure benzo(a)pyrene was added to the same plate. Plates were placed in a development chamber and the solvent was allowed to travel 15 cm from the origin. The developed chromatogram was observed under a 3600 A light source and the fluorescent area of the pure standard and corresponding area of the sample were scored with a stylus. The amount of benzo(a)pyrene in the sample was determined at 375, 382 and 390 micrograms on a Beckman DU spectrophotometer. The thin-layer chromatogram exhibited 19 distinctively different fluorescent bands similar in spectral characteristics to clean-fractions emergent from an alumina column separation. Advantages included: (1) the separation of crude organic extracts required less than 1 hour, and the speed of separation did not affect resolution; (2) benzo (ghi) perylene, which absorbs at 382 millimicron and would constitute a major interference, was contained in a narrow yellow fluorescent band well separated from the benzo(a)pyrene fraction; (3) benzo(k)fluoranthene and several unknown compounds were found in a blue fluorescent band separating the benzo(a)pyrene and benzo(ghi)perylene fractions; (4) samples ranging from 0.5 to 5 milligrams could be resolved on a 250-micron film of the absorbent with no observed changes in the chromatogram; (5) variations in Rf values above 0.5 did not prevent determination of the benzo(a)pyrene present in the sample; (6) over-activated plates that gave poor separations could be returned to normal in several hours by storage in a vacuum desiccator adjusted to 45% RH with freshly prepared aqueous H2SO4. The more experienced technician analyzed samples ranging from 0.14 to 1.26 mg; when all results were used the mean benzo(a)pyrene concentration per gram extract was 546 micrograms and the relative standard deviation was plus or minus 7%. The investigation showed also that benzo(e)pyrene could be determined in the same fractions eluted for the determination of benzo(a)pyrene.##

04460

E. I. Smith, Jr., and H. E. Moran, Jr.

PORTABLE DETECTOR FOR MIXED HYDRAZINES PROPELLANT FUEL VAPORS AT LOW CONCENTRATION. Naval Research Lab., Washington, D.C., Engineering Research Branch. (NRL Memorandum Rept. 1692.) Apr. 1965. 15 pp.
DDC, AD 616821

Paradimethylaminobenzaldehyde (DMABA) was examined as a color forming agent for the colorimetric determination of mixed hydrazines propellant fuel vapor in air. Contaminated air was drawn through a filter paper disc which had been moistened with DMABA solution. The reaction between the fuel vapor and the indicator until the yellow color matched an arbitrarily selected standard yellow color. The volume of air required to produce the standard color was related to the concentration of fuel vapor in the air over the range of 0.5 to 10 ppm. Several gases which might be found in the air at least occasionally were examined for interference with the fuel vapor test. Ammonia at 50 ppm did not interfere, but higher concentrations either decreased the indicator sensitivity or completely inhibited color formation. Sulfur dioxide at 500 ppm did not interfere with the test; higher concentrations did interfere. Carbon dioxide at concentrations up to 50,000 ppm (5%) did not affect the test. Chlorine at 2 and 5 ppm reduced the sensitivity of the test indicator. Fifty ppm and higher concentrations of chlorine formed brown or green colors with the indicator, thus interfering with the fuel vapor test. (Author abstract)##

04488

N. F. Chdanov, A. V. Kiselev, Ya. I. Yashin

USE OF COARSE POROUS GLASS IN GAS-ADSORPTION CHROMATOGRAPHY FOR THE SEPARATION OF LIQUID HYDROCARBONS. Neftekhimiya (Russia) 3, (3) 417-24, 1963. Russ. (11.)
DDC, AD 610970

The possibility of using coarse porous glass for the separation of normal alkanes and aromatic hydrocarbons with boiling temperatures up to 150 degrees by the method of gas-adsorption chromatography was investigated. The dependence of the effectiveness of the coarse porous glass column on the linear speed of the gas-carrier indicated the possible use of such columns at great linear speeds. From the chromatograms taken at various temperatures, the adsorption heats of a series of hydrocarbons on the hydroxylated surface of silicon were determined. The adsorption heats of normal alkanes and normal alkyl benzenes increase linearly with the increase in the number of carbon atoms in the molecule. The adsorption heat of ethylene is greater than that of benzene, and that of alkyl benzene is greater than that of the corresponding n-alkanes because of the specific interaction, primarily of the electron bonds with the hydroxyl groups of the surface. The values determined from the chromatograms of heat adsorption were close to those obtained calorimetrically.##

04541

R. Feldstein and S. Balestrieri

THE DETECTION AND ESTIMATION OF PART PER BILLION CONCENTRATIONS OF HYDROCARBONS. J. Air Pollution Control Assoc. 15, (4) 177-8, Apr. 1965.

The addition of a freeze-out step in liquid nitrogen prior to analysis by gas chromatography with flame ionization detection permits the accurate determination of C2 and higher hydrocarbons in the part per billion (ppb) range. The procedure involves passage of an accurately measured volume of approximately one liter of gas sample through a freeze-out trap immersed in liquid nitrogen. After flushing with a measured volume of He to remove trapped N2 and O2, the hydrocarbons are flushed into the gas chromatograph analytical column by immersing the trap in a beaker of hot water. Concentrations of C2 and higher hydrocarbons have been measured in commercial cylinders of N2, He and H2. Using a 150 ml sample of gas, recovery of ppb concentrations is 95 to 100%. (Author abstract modified)##

04547

A. Turk, J. I. Mattson, H. E. Kaplan

OLEFIN ISOMERIZATION IN ADSORPTIVE SAMPLING ON ACTIVATED CARBON. Anal. Chem. 34, (5) 561-4, Apr. 1962. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

To assess the validity of adsorptive sampling of atmospheres for gases and vapors, it is necessary to determine the degree to which the sample is altered prior to analysis. In sampling atmospheres for olefinic vapors, the known proclivity of some structures to undergo double bond or skeletal rearrangement and the importance of the molecular location of the double bond in determining the degree to which the olefin may act as a smog precursor, make the study of isomerization important. In this investigation, bisethallyl, bisallyl, and 1-hexene were selected for study of olefin isomerization in adsorption and desorptive with activated carbon. Bisethallyl, which is particularly labile to isomerization to conjugated dienes, produces 5 to 15% rearranged products. Bisallyl, which is generally more resistant to change, yields 1 to 2% rearrangement. The mono-olefin, 1-hexene, gives no detectable change. It is concluded that most gasoline-range hydrocarbons can be sampled on carbon and recovered for analysis without serious double bond migration or skeletal rearrangement. New designs for desorption apparatus are described. (Author abstract)##

04596

R. Smith

PROGRAM DEVELOPMENT THROUGH APPLYING MEASUREMENTS AND MONITORING KNOW-HOW. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 233-45. 1963.

Author directs our attention to the problem of appropriate air quality. Many large communities are able to deal with the direct nuisance problem in which there is a specific individual source of pollution and some rather direct social or economic effects on adjacent inhabited areas. While such programs eliminate many source of complaint, they seldom provide a community with an overall air quality of a desirable nature. Although this problem is complex and knowledge is imperfect, author discusses simple guidelines through which reasonable long-range objectives can be delineated. Such objectives are capable of periodic evaluation as knowledge and technique improve.##

04631

J. Tighe, R. R. Ragdahl, and E. J. Center

DIRECT INFRARED SPECTRAL ANALYSIS OF CONTAMINANTS IN THE ATMOSPHERE (A PRELIMINARY STUDY). Preprint. 1951.

A preliminary study of the application of infrared spectral analysis to the direct examination of the atmosphere for contaminants has been made. A Beckman IR-2 infrared spectrometer and auxiliary equipment have been assembled and infrared-absorption spectra obtained for compounds in the air in the concentration range of 0.2 to 25 ppm (vol/vol). This range is of interest in air-pollution work. Improvement of the equipment should lower the minimum detectable concentration by a factor of at least five. The work indicates that a commercial infrared spectrometer, together with simple and inexpensive auxiliary equipment, may be made sensitive to permit direct spectral atmospheric analyses in the field.##

04635

W. F. Gerarf, F. E. Budinger, and P. R. Mueller

TOXICITY EVALUATION OF AIR POLLUTANTS BY USE OF LUMINESCENT BACTERIA. Atmos. Environ. (London) 1, (1) 21-32, Jan. 1967. (Presented at the Seventh Conference of Methods in Air Pollution Studies, Los Angeles, Calif., Jan. 25-26, 1965.)

Cells of a species of luminescent bacteria were treated with a gas stream containing products formed by the photochemical oxidation of cis-2-butene and NO. Luminescence and viability decreased with the time of irradiation of reactants. The rate of luminescence decrease was dependent on the ratio of the initial concentrations of cis-2-butene and NO with a ratio of giving the most rapid loss. Known photochemical oxidation products, ozone,

NO2, formaldehyde, acetaldehyde, and PAN were examined individually. Aldehydes did not appear to contribute to the decrease in luminescence but ozone and PAN did. Although NO2 alone up to 0.5 ppm produced no decrease, it may contribute to the luminescence loss in the total irradiation mixture. The total oxidant concentration produced upon irradiation gave luminescence decreases which were matched by comparable concentrations of pure ozone. However, this does not imply that luminescence losses caused by photochemical oxidants are due only to ozone. A possible mechanism of the toxic effect and the interpretation of this bioassay in relation to other organisms are briefly discussed. (Author abstract)**

04648

Y. Matsumura

THE ADSORPTION PROPERTIES OF ACTIVE CARBON. II. PRELIMINARY STUDY ON ADSORPTION OF VARIOUS ORGANIC VAPORS ON ACTIVE CARBON BY GAS CHROMATOGRAPHY. Ind. Health (Japan) 3, 121-5, Dec. 1965.

Gas chromatography was used to observe the retention times of thirteen organic vapors on active carbon. The compounds were n-alcohols of C1-C4, n-paraffins of C5-C6, acetone, methyl ethyl ketone, diethyl ketone, ethyl acetate, cyclohexane, benzene, and carbon tetrachloride. The active carbon was a commercial activated wood charcoal produced for gas mask canisters. The retention times of the organic vapors depended upon the temperature of the column in accordance with Arrhenius' equation in the range of 50-250 C. In the homologous series of n-alcohols and ketones, the logarithmic retention times were in linear relation with their boiling points respectively at each temperature of 150, 200, and 250 C. Retention time of each compound was extrapolated to 50 C. by Arrhenius' relation to obtain their relative retention times to compare with that of carbon tetrachloride at that temperature. (Author summary modified)**

04667

M. R. Sharma, B. R. McLean, J. Hardwell

AN APPARATUS FOR THE ANALYSIS OF COMBUSTION PRODUCTS OBTAINED DURING THE OXIDATION OF HYDROCARBONS. Indian J. Technol. (India) 3, (7) 206-8, July 1965.

A gas chromatographic apparatus with several improved features, permitting the analysis of complex mixtures of combustion products obtained during the oxidation of hydrocarbons is described. The improved features are (1) a sampling device that avoids the use of stopcock grease and permits operation at elevated temperatures and pressures; (2) six-way valves that facilitate sample injection; and (3) a dual-column gas chromatograph permitting separation of compounds with widely varying boiling points. The products obtained by the low temperature (250 C.) oxidation of propane and butane have been analysed using this apparatus. Although the

gas chromatographic method is particularly appropriate for most types of combustion products, it is less satisfactory for certain highly reactive products, namely hydrogen peroxide, formaldehyde and organic acids. The presence of formaldehyde in the combustion gases has a detrimental effect on the gas chromatographic analysis for certain other compounds, notably methanol. (Author abstract modified)**

04716

S. L. Sachdev, J. W. Robinson, and F. W. West

EFFECT OF MIXED ORGANIC SOLVENTS ON ATOMIC ABSORPTION SPECTROPHOTOMETRY OF REFRACTORY METALS. Anal. Chim. Acta 37, 156-63, 1967.

The effect of various organic solvents on the absorption signal of vanadium in fuel-rich oxy-acetylene flames and nitrous oxide-acetylene flames was investigated. The absorption of the 3183.9 A line of V was greatly enhanced by the use of various mixed organic solvents when fed to oxy-acetylene flames. In general, the solvents' effect was in the following order: Propanol-2 greater than ethanol which was greater than methanol. Results showed that absorption was maximum in highly reducing flames and increased as the concentration of organic solvent increased. Maximum absorption was observed when the solution contained more than 70% of the respective solvents. In the case of nitrous oxide-acetylene flame, the addition of diethylene glycol (about 8% in the final solution), and similar compounds, to the aqueous solution of V increased the absorption by about 50%.**

04792

H. Nakamoto and T. Kusima

RELIABILITY OF MEASUREMENT OF EVAPORATED BENZENE HOMOLOGUE CONCENTRATIONS WITH THE BENZENE-DETECTION TUBE. Japan J. Ind. Health (Tokyo) 3, (8) 419-21, Aug. 1961. Jap.

A study was made of the reliability of measurement with the benzene detection tube, widely used to measure the amount of benzene and its homologues in the air of workshops. The richer the benzene concentration in the air, the larger the probable error of the mean of obtained values, whereas the coefficient of variation of obtained values is at a minimum when a benzene detection tube is used. The same results were obtained in cases of toluene and its mixture with benzene in the air of workshops. When the benzene-like mist in the workshop air which evaporated from sprayed paint was examined, the values obtained with the benzene-detection tubes showed half of the values obtained by the sulfuric acid-formalin method. (Author summary modified)**

04772

R. Alperstein and R. L. Bradow

COMBUSTION GAS SAMPLING VALVE. Rev. Sci. Instr. 36, (7) 1028-31, July 1965.

A valve suitable for extracting a sample of high temperature, high pressure gases and introducing this sample into a low pressure region has been developed and successfully operated for two years. Slow combustion reaction studies in a normally-fired spark-ignition engine are being accomplished with the aid of this gas sampling valve located in the combustion chamber end-gas region. The valve exhibits excellent sealing, achieves choked flow conditions, and permits sampling times on the order of 1 msec. The construction, operation, and monitoring of this gas sampling valve are described. (Author abstract)##

04796

J. E. Sigsby, Jr.; L. J. Lage; T. Bellar; and R. L. Eisele

CHEMICAL METHODOLOGY IN AUTO EXHAUST STUDIES. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

A major auto exhaust research project requires extensive chemical analytical support. Such compounds as NO, NO_2, acrolein, and the individual hydrocarbons and such classes of compounds as olefins and oxidants are determined routinely. Sampling schedules and conditions are important in the over-all program. This paper describes the specific analyses and the general laboratory program that provide the greatest amount of significant chemical information. The procedures discussed include IR spectroscopy, wet chemical analysis and gas chromatography. Wet chemical analyses are made for NO_2, NO, four-carbon and higher olefins, acrolein, and formaldehyde. All samples for wet chemical analysis are taken with bubblers. A Beckman Spectrophotometer, Model DU, is used to determine absorbance. For hydrocarbon analysis the gas chromatograph used is a modified three-stage instrument. The first and second stages are operated in series, using thermal conductivity detectors and helium carrier gas. The third stage operates separately with a flame ionization detector and a silica gel column to determine the higher hydrocarbons. The first two stages are used in conjunction with a double trapping system to determine four-carbon and higher materials. The utilization of this array of testing methods and equipment requires careful planning, if each experiment is to yield maximum information. On one occasion 50 samples were analyzed in a 6-hour period; this is more than one sample every five minutes, and is typical of the quantity of data that may be obtained if necessary. Normally, the reproducibility of the chemical results is better than 10%.##

04825

R. Malanchuk

CONTINUOUS AUTOMATIC DETERMINATION OF SULFUR DIOXIDE IN THE PRESENCE OF AUTO ENGINE EXHAUST. Am. Ind. Hyg. Assoc. J. 28, 75-82, Feb. 1967.

An instrument normally used for measuring nitrogen oxides was found suitable for the continuous automatic monitoring of sulfur dioxide under conditions that exist in animal exposure chambers. This was accomplished by substituting a ferric-phenanthroline solution for the Saltzman reagent that is required for nitrogen oxides in such an instrument. The arrangement has the advantage of being specific for SO2 determination under conditions similar to those mentioned above. The conductimetric-detector instrument employing water for the absorption medium has severe limitations in accurately determining SO2 in the complex engine exhaust composite. The conductimetric instrument using hydrogen peroxide has fewer limitations. Typical of colorimetric methods involving an absorption step and a color-developing period, this instrument has a 20- to 30- minute delay in response. Modification of the equipment to suit the analytical method should result in faster response, greater sensitivity, and wider range. For example, thermostating the absorption section for operation at a higher temperature, such as the 50 C would yield greater sensitivity. A lesser coil and sample cell volume would produce a faster response.##

04819

R. K. Stevens and R. E. Painton

APPLICATION OF A HOT WIRE IONIZATION DETECTOR TO AUTOMOTIVE EXHAUST GAS ANALYSIS. Micro Tek Instruments Corp., Baton Rouge, La. Mar 17, 1967. 26 pp.

The objective was to investigate the application of a catalytic combustion ionization detector to the determination of hydrocarbons in automotive exhaust. The catalytic element is a coiled platinum hot wire of the general type used in conventional catalytic combustion detector cells in which thermal effects are measured. In the present device the effect measured is the ion current resulting from charged radicals formed during the process of catalytic combustion. A major feature of this technique for auto exhaust gas analysis is its complete selectivity to C3+ hydrocarbons in the presence of CO, H2, CH4, CO2, air and H2O. The effect of operating parameters on selectivity to different types of hydrocarbons was examined, results are compared to those obtained with the Flame Ionization Detector, and typical results on actual auto exhaust samples are reported. The CCID (Catalytic Combustion Ionization Detector) can be a critical component in a composite "black box" analyser to be used for field surveillance of automobile exhaust with regard to emission of hydrocarbons and carbon monoxide. (Author summary modified)##

04057

G. Dimitriades

DETERMINATION OF NITROGEN OXIDES IN AUTO EXHAUST. J. Air Pollution Control Assoc. 17, (4) 238-43, Apr. 1967.

A new procedure for determining nitrogen oxides in automobile exhaust has been developed. The new procedure was included in a Bureau of Mines comparative study that aimed at evaluating various widely used methods for determing NOx in auto exhaust. The methods included in the evaluation study follow: (1) Static oxidation in tank (ST method). The method involves oxidation of NO in residence with O2 in a stainless steel tank. (2) Bureau of Mines method (BM method). The method involves application of the ST procedure in exhaust samples from which the hydrocarbons have been removed by combustion over catalyst. (3) Chevron Research method (CR method), as described in the literature. (4) Phenoldisulfonic acid method (PDS method), as described in the literature. The principal objective of this study was to generate experimental evidence which would lead to defining an optimum procedure for converting NO, present in exhaust gas, into NO2; this conversion is desired so that the total of NO + NO2 can be determined quantitatively in the form of NO2. In pursuing this objective, the procedures prescribed by the foregoing methods were comparatively tested. The results indicated that all four methods are subject to error, the extent of which depends on the conditions employed. The BM method was superior from the standpoint of accuracy because it was less affected by interferences due to hydrocarbon-NO2 reactions. (Author abstract)##

04060

R. C. Newbury

THE USE OF THE CORRELATION SPECTROMETER IN THE STUDY AND CONTROL OF AIR POLLUTION. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

The Barringer Correlation spectrometer is a highly specific instrument offering great advantages in pollutant monitoring: (1) It is a physical measurement and does not require frequent renewal of reagent solutions; (2) It can operate through a wide range of temperatures; it does not require constant temperature enclosures, or even protection from freezing; (3) It requires no pumps or valves. The passive model requires power only for the electronics and remote operation using solar cells if possible; and (4) The basic instrument is suitable for a large number of compounds, reducing drastically, the spare parts and expertise required, in comparison with the usual range of unrelated instruments. The Barringer Tape Sampler is a modular sampler of improved design and with a very flexible timing control unit. The sequential sampler module will be additive for extended sampling schedules.##

04881

A. B. Barringer

NEW INSTRUMENTATION AND TECHNIQUES FOR POLLUTION MONITORING. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

Correlation spectrometers utilize an internal memory of the spectrum which it is desired to detect. Real time correlation is carried out against the spectrum of the incoming radiation. The first of these devices used a conventional grating spectrometer. A photographic replica of the spectrum of the gas being detected is installed in the position normally occupied by the slit of a dispersive spectrometer. A spectrometer is used to make the replica mask, by exposure through a cell of the gas, matching exactly the dispersion and aberration characteristics of the spectrometer. The unknown spectra of the incident light is caused to vibrate across the correlation mask, by using a refractor plate oscillating in a rotary fashion to displace the entrance slit image from side to side. Phase locked detection of the output of the photo-multiplier is carried out in synchronism with the oscillations of the refractor plate. Integration of the synchronous detection can be made over a period varying from a fraction of a second to several seconds. A telescope may be incorporated in the instrument. Alternative means may be employed for oscillating the slit image such as a high stability tuning fork and dual refractor plate assembly. An instrument of this type has been programed for sulfur dioxide detection. It is capable of detecting concentrations as low as ten parts per billion over a one hundred meter pathlength. It is highly specific for sulfur dioxide having an excellent immunity of interferences. Operation is in the ultraviolet region between 2,900 and 3,150 Angstroms where there is sufficient solar spectral radiant flux penetrating the atmosphere to enable the equipment to function passively using natural daylight. An automatic gain control system operates on the average DC value of the photomultiplier output. The AC signal under these conditions is directly proportional to the percentage modulation caused by sulfur dioxide.##

04885

R. H. Thompson, C. A. Rau, and C. H. Lawrence

IDENTIFICATION OF VEHICLE TIRE RUBBER IN ROADWAY DUST. Am. Ind. Hyg. Assoc. J. 27, (6) 488-95, Dec. 1966.

A technique combining pyrolysis and chromatography for the detection of vehicle tire abrasion products in roadway dust is described. Samples of elastomers used in tire formulations were volatilized and separated by gas-liquid chromatography to provide characteristic chromatograms. These identifying patterns appeared consistently in the chromatographic separations of the pyrolysates of compounded tire rubber and various roadway dusts. To confirm the technique, two chromatographic procedures were used for the identification of specific components of the thermal degradation products of raw elastomers, compounded rubbers, and roadway dusts. (Author abstract)##

04910

Hauser, T. R.

THE DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR PARTICULATE MATTER. Preprint, ((Public Health Service, Cincinnati, Ohio, Div. of Air Pollution,)) ((19))p., 1965. 12 refs.

The determination of the polynuclear aromatic hydrocarbon content of air particulate matter is described. Air particulate samples are collected on glass fiber filters using a high volume air sampler. The samples are then extracted with benzene in a Soxhlet extractor to obtain a benzene soluble fraction of air particulate matter which is normally referred to as the "organic fraction." This organic fraction is then further separated into approximately 10 to 40 sub-fractions by means of column chromatography of alumina using increasing amounts of diethyl ether in pentane as the eluent. Each of the sub-fractions is dried, dissolved in pentane, and spectrophotometrically analyzed for polynuclear aromatic hydrocarbon content. The polynuclear aromatic hydrocarbons that can be effectively separated and analyzed by this technique if they are present in a particular air sample are anthracene, phenanthrene, fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(a)pyrene, benzo(e)pyrene, perylene, benzo(g,h,i)perylene, anthanthrene, and coronene. Reference is made to review articles which discuss other techniques for the analysis of polynuclear aromatic hydrocarbons, particularly in urban air and from coal tar pitch.##

04911

R. J. Charlson, H. Horvath, and R. F. Pueschel

THE DIRECT MEASUREMENT OF ATMOSPHERIC LIGHT SCATTERING COEFFICIENT FOR STUDIES OF VISIBILITY AND AIR POLLUTION. Atmospheric Environ. 1 (6), 469-78 (July 1967)

The integrating nephelometer of Beuttel and Brewer has been modified for studies of air pollution. The instrument, which is simple, stable, and inexpensive to construct, has been operated continuously for several months. Interpretation of the data is simplified by use of a theoretical approach which indicates that the measured light scattering coefficient is proportional to the mass of suspended particulates for well-aged atmospheric aerosols. (Author abstract)##

04960

S. W. Nicksic and R. E. Rostenbach

INSTRUMENTATION FOR OLEFIN ANALYSIS AT AMBIENT CONCENTRATIONS. J. Air Pollution Control Assoc. 11, (9) 417-20, Sept. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

This paper describes a bromination and coulometric system and the instruments developed to measure olefins in automobile exhaust and in the atmosphere. The concentration of olefins in automobile exhaust considered here is over 100 ppm while that in the atmosphere is usually less than 5 ppm. The method is based on the observation that the olefins, excluding ethylene, can be quantitatively brominated by passing a gas sample through a solution of appropriate composition. The method is based also on the principles of coulometric titration. The system differs from the conventional coulometric practice in the bromination is carried out before coulometry. The excess of bromine to do this is about 0.00002 moles per liter. In this system, the gas sample is passed through the sensing solution and the time is measured to generate the bromine absorbed by the sample. The two Olefin Analyzers developed - one for atmospheric use and one for auto exhaust analysis are self-contained portable instruments for automatic, continuous olefin analysis of a gas sample or stream. These were designed for operation with a recorder modified slightly for this purpose.##

05971

F. L. Magill

TECHNIQUES EMPLOYED IN THE ANALYSIS OF LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1950, pp. 61-8.

An analysis of smog was undertaken with the major objectives being the determination of the materials responsible for the reduction of visibility and those responsible for eye irritation. The instruments and methods used for collecting particulate and gaseous matter from the atmosphere are described. A new method for semi-quantitative analysis of samples by proton bombardment is explained. A tabular summary of the components of Los Angeles smog is provided. The effects of particulate matter on visibility are described and a simulation experiment is mentioned which shows eye irritation to be the result of the synergistic effect of several substances.##

05062

J. E. Johnson, Chiantelis, A. J., W. D. Smith, and R. F. Umstead

NUCLEAR SUBMARINE ATMOSPHERES. PART I. AROMATIC HYDROCARBON CONTENT. Naval Research Lab., Washington, D. C., Chemistry Div. (NRL Rept. 6131.) Aug. 29, 1964. 32 pp.

A detailed analytical study has been directed to the identification and determination of the amounts of aromatic hydrocarbons present in nuclear submarine atmospheres. Many individual aromatic hydrocarbons have been identified and their occurrence in a number of nuclear submarines has been established. The hydrocarbon oil samples were described from activated carbon which had been exposed in nuclear submarine atmospheres. The

aromatic hydrocarbon content of these oils was found to be approximately 25 to 30 percent of the total. The quantitative distribution of individual aromatic hydrocarbons was very similar from submarine to submarine with this distribution strikingly similar to that of typical petroleum distillates in the same boiling range. (Author abstract)##

050561

50561
R. A. Stuart

APPLICATION OF GAS-LIQUID CHROMATOGRAPHY FOR DETERMINATION OF TRACE HYDROCARBONS IN AIR AND COMPRESSED BREATHING GASES. Naval Research Establishment, Dartmouth, Nova Scotia, Canada, Defense Research Board. Mar. 1961. 10 pp. (NRE Dept. No. 61/3.)

A method for gas-liquid partition chromatographic analysis of the hydrocarbons commonly found in petroleum vapors is described. The relative retention times of some hydrocarbons are listed and preliminary evidence of their distribution in gasoline vapors is given. Modifications which allow the use of conventional gas chromatographic apparatus for the detection of these hydrocarbons at or below 1 p.p.m., and the technique as it can be applied to the determination of such contaminants in compressed breathing gases are discussed. (Author abstract)##

050088

R. Bothwell,6 and J. R. Whitehead

COMPLEX FORMATION, ISOLATION, AND CARCINOGENICITY OF POLYCYCLIC AROMATIC HYDROCARBONS. Nature 214, (5078) 797, Feb. 1967.

Methods for the isolation of polycyclic aromatic hydrocarbons which are based on partition, adsorption or complex formation used singly or in combination, are reviewed. A new electrophoretic method and its possible relationship to carcinogenic activity is considered. Using curtain paper electrophoresis with platinum electrodes in troughs at the top and bottom of the paper, complexes of polycyclic aromatic hydrocarbons with both caffeine and 1:3:7:9-tetramethyluric acid (TMU) have been found to migrate readily. Complexes were formed before spotting on the paper; the solvent was a solution of 2 g purine in 90 ml. water+10 ml. ethanol+2 ml. ammonia and the potential and current were 30-35 V/cm and 1-4 m.amp/cm. The twenty-five complexes of polycyclic aromatic hydrocarbons examined all migrated as discrete spots which completely left the baseline. Using the same method, it was later shown that these polycyclic aromatic hydrocarbons could be separated from twelve times their own volume of 'vaseline'. In large scale applications of the method, as much as 1 g of hydrocarbon mixtures containing polycyclic aromatic hydrocarbons has been adsorbed on 80-100 g silica and the residue packed into a column 10 cm in diameter. By applying a potential of 1,200-1,500 V to the column and slowly eluting with

the solvent already mentioned, almost all the species which could be detected by electron capture during gas-liquid chromatography have been separated from the bulk of the mixture which remained on the column. Furthermore, in experiments in which radioactively labelled polycyclic aromatic hydrocarbons were incorporated in the hydrocarbon mixture, 97-98 per cent of the labelled polycyclic aromatic hydrocarbons were isolated. The exact experimental details of the method, which is now being used with most encouraging results to examine the condensate of cigarette smoke, are to be published subsequently.**

05092

M. G. Sigler, and W. F. Phillips

A THIN-LAYER CHROMATOGRAPHY METHOD FOR ESTIMATION OF CHLOROPHENOLS. Environ. Sci. Technol. 1, (1) 65-7, Jan. 1967.

A highly sensitive, rapid, and selective thin-layer chromatographic method is used for the determination of 4-chlorophenol, 2,4-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol and pentachlorophenol in a ra nd treated water. The two-directional thin-layer chromatograph.. technique employs two supplementary reagents, 4-aminoantipyrine and silver nitrate, both of which provide independent sensitivities of less than 1 p.p.b. The technique has been applied to surface waters before and after treatment and should be useful to investigators studying the effects of water treatments. Concentrations of 0.1 microgram per liter or more can be determined using 1-liter samples and the silver nitrate reagent. Confirmation of 0.5 microgram per liter or more can be readily achieved with the 4-aminoantipyrine reagent, again using 1 liter as the sample size. The use of two separate chromogenic reagents, one of which responds to phenols and the other to the halogen, in conjunction with thin-layer chromatography, provides a very high degree of specificity. The method is rapid, offers good recovery and reproducibility, and has been found satisfactory for all samples of waters encountered.**

05139

J. E. Sigsby, Jr.

DISCUSSION ON GAS CHROMATOGRAPHY - MEASURING EXHAUST HYDROCARBONS DOWN TO PARTS PER BILLION BY L. J. PAPA. Preprint. (Presented at the Mid-Year Meeting, Society for Automotive Engineers, Chicago, Ill., May 16, 1967.)

A critical discussion of the subject paper is presented. The subtractive technique, when applied to simple instrumentation, may yield considerable information on internal composition without producing vast masses of data. Schemes for the detailed analysis of gas chromatograph data usually involve guessing either by compound type or by a reactivity scheme, which partially negates the value of the detailed analysis. The system described for the total gas chromatographic analysis of automotive exhaust appears to be one of the most workable systems so far presented.

it results in a single data output which might lead to significant dollar savings in data reduction. The use of plastics at any point, in any sampling procedure, should be evaluated. It is not desirable to use polyethylene or saran for calibration, daily standards, or any other application in which higher-molecular-weight hydrocarbons may be involved. A column of mixture Porapak Q and P separates most of the hydrocarbons, but does not afford a separation of propane and propylene. The use of silica gel for such a column, with or without support modification, might well afford a complete separation. Information on any technique, other than an initial ice trap, for removing the water would be appreciated. Most techniques interfere with detailed analysis by removing many specific hydrocarbons. Differences have been noticed between static and dynamic sampling systems. If one samples dynamically through a system that is maintained at reasonably constant flow, equilibrium is reached rather quickly and there is no apparent increase in response with increased flow time. The only apparent necessity is to allow for complete flushing of all sample lines, for approximately 10 times the volume. Valve leakage may be corrected by lapping both the rotor and the base of two surface valves carefully. Only valves of Teflon and stainless steel should be used. Changes in composition of exhaust have been found in various classes of hydrocarbons. These differences are quantitative rather than qualitative. The overall gas chromatographic pattern of the fuel closely resembles that of the exhaust. Quantitatively, however, variations as large as 20 or 30 per cent from predicted concentrations may occur.##

05136

Sawicki, E. and R. A. Carnes

FLUORIMETRIC ASSAY FOR ALPHA-GLYCOLIC COMPOUNDS AND OTHER ALDEHYDE PRECURSORS . Microchim. Acta, No. 3:602-607, 1958. 2 refs.

Three reagents and a variety of fluorimetric methods are introduced for the assay of alpha-glycolic compounds, polar olefinic compounds, and olefins. The procedures are based on the controlled oxidation of these compounds to aldehydes and analysis of the aldehydes with J-acid, 2,4-pentanediones, or dimedon. Most of the methods show reasonable sensitivity and accuracy and should be capable of use in air pollution studies. Recommendations are made for their use. Results confirm the presence of large amounts of alpha-glycolic compounds in aqueous extracts of urban airborne particulates. (Authors' abstract)##

05170

F. G. Rounds, and H. W. Pearsall

DIESEL EXHAUST ODOR (ITS EVALUATION AND RELATION TO EXHAUST GAS COMPOSITION. Vehicle Emissions (Selected SAE Papers) 6, 55-69, 1964. (Presented at the National Diesel Engine Meeting, Society of Automotive Engineers, Chicago, Ill., Nov. 1-2, 1956, Paper No. 861.)

Techniques, based on panel estimates, were developed for evaluating the odor and irritation intensities of undiluted Diesel engine exhaust gases or of various dilutions of these gases in air. Along with the estimates, chemical analyses were made to determine the concentrations of total aldehydes, formaldehyde, and oxides of nitrogen. Statistically significant correlations were found between odor or irritation intensity estimates and the analytical data, but these correlations were too weak to permit accurate prediction of odor or irritation from chemical analyses. The effects of some engine variables on Diesel odor were studied. Possible means of reducing Diesel odor are discussed. Limited studies indicated that engine load has a pronounced effect on exhaust odor and irritation intensity. Engine make, engine speed, engine condition, fuel type and lubricating oil type had comparatively little effect.##

05191

A. B. Barringer

DEVELOPMENTS TOWARDS THE REMOTE SENSING OF VAPOURS AS AN AIRBORNE AND SPACE EXPLORATION TOOL . Proc. Symp. Remote Sensing Environ., 3rd, Ann Arbor, Mich., 1964, pp. 279-92. Feb. 1965

The remote sensing of geochemical parameters is investigated. The techniques under study and development are concerned with sensing the dispersion of volatile components of orebodies or their oxidation products in the surface soils and in the air above. The elements and compounds of interest include mercury, iodine and sulphur dioxide in connection with metal bearing deposits, and hydrocarbon gases and iodine in association with oil fields. (Author abstract)##

05210

A. A. Belyakov

DETERMINATION OF CARBON TETRACHLORIDE IN AIR. Gavodsk. Lab. (Moscow) 23, (2) 161-2, 1957. Russ. (Tr.)

Determination of carbon tetrachloride and chloroform by colorimetric analysis is discussed. The method involves application of the condensation reaction between 2,4-dinitrochlorobenzene and pyridine to form pyridinium chloride which is converted by hydrolysis to glutaconic aldehyde and 2,4-dinitroaniline. The color reaction depends on the formation of derivative of glutaconic aldehydes and reaction of the latter with aniline. A standard scale of colored solutions was established to evaluate the concentrations. It is possible to determine 1 ga of carbon tetrachloride (CCl4) in 1 ml of solution with an average error of 4.5%. In the case of chloroform (CHCl3), 0.5 ga per ml can be analysed.##

05257

F. E. Saalfeld

MASS SPECTROMETRIC DETERMINATION OF THE ALIPHATIC AND AROMATIC CONTENT OF A HYDROCARBON MIXTURE . Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6178.) Nov. 12, 1964. 8 pp.

A simplified mass spectrometric technique has been devised for determining the aromatic content in hydrocarbon mixtures of the type that have been recovered from adsorptive carbon samplers exposed in the atmospheres of nuclear submarines. The method is based on the summation of ion currents at mass-to-charge ratios (m/e) of 27, 28, 29, 41, 43, and 57 for aliphatic hydrocarbons and aromatic hydrocarbons. The mass spectrometric results agree reasonably well with Fluorescence Indicator Adsorption analyses of the same samples. While, due primarily to cost and operational complexity, no available mass spectrometers are suitable for shipboard operation, future developments in the field of mass spectrometry should be carefully observed for advances that make such use possible. (Author abstract)

05261

P. G. Jeffery, and P. J. Kipping

GAS CHROMATOGRAPHY FOR THE ANALYSIS OF EXHAUST GASES. Proc. Inst. Mech. Engrs., London, Engl., 1966. 180 (3G), 95-100 (1966).

The traditional methods for the analysis of vehicle exhaust gases have never been entirely satisfactory. The recent development of gas analysis by gas chromatographic methods offers considerable improvement in accuracy, precision, and also in time required. Difficulties still arise for certain constituents, notably sulphur dioxide and oxides of nitrogen, for which chemical methods of analysis are still preferred. The chromatographic analysis of the hydrocarbon fraction and the remaining inorganic fraction of exhaust gases, where this is required, is now a routine operation, calling for neither expert chromatographic knowledge, nor exceptional skill in manipulation. A typical gas chromatograph may be considered as comprising a number of simple building blocks, including a carrier gas flow system, a sample inlet mechanism, a chromatographic material for component resolution, a detector for those components of interest, and a display mechanism. Some form of electrical control is required; this may amount to little more than a Wheatstone bridge network, or may be a high quality linear amplifier and associated voltage-decade supply for the more sophisticated ionisation detectors. Each of these building units is considered in detail, and the errors that can arise in the course of making an analysis of an exhaust gas are noted. The possibility of gross errors arising from defective equipment is also considered.##

05299

R. Rate

STANDARDIZATION OF METHODS OF MEASUREMENT OF AIR QUALITY IN MEMBER COUNTRIES . Preprint. (1963)

Measurement methods for dust fall, suspended particulates, sulfur dioxide, sulfur trioxide, sulfuric acid, nitrogen oxides, ozone or oxidants, and hydrocarbons are reviewed. Standardization of techniques and methods of reporting data is a prerequisite for international exchange of information and for further co-operative research in order to establish a sound basis for the control of air pollution.

05319

Engel, C. R., and W. Hawicki

A SUPERIOR THIN-LAYER CHROMATOGRAPHIC PROCEDURE FOR THE SEPARATION OF ASA ARENES AND ITS APPLICATION TO AIR POLLUTION. J. Chromatog., Vol. 31, p. 109-119, 1967. 8 refs.

A thin-layer-chromatographic method for separation of polynuclear asa heterocyclic compounds with silica gel is presented which is superior to previously reported paper and thin-layer chromatographic methods. Many of the groups of compounds had run together in previous separation methods. This procedure has been applied to the separation of various basic fractions of interest in air pollution studies. Benz(c)acridine, benzo(h)quinoline, acridine, benz(a)acridine, and phenanthridine can be separated and identified in these samples with the help of two-dimensional thin-layer chromatography on silica gel-cellulose (2:1). In addition, a column chromatographic separation of a basic fraction of coal-tar pitch, with silica gel as the adsorbent, was investigated, and the amounts of benz(c)acridine and benz(a)acridine were estimated. Evidence obtained from the absorption spectra indicates the presence of a large number of unknown and previously identified compounds in the fractions. The various silica gel methods are recommended for use in air pollution studies. (Authors' abstract)

05322

MONITORING OF CONTAMINANTS. THE FIRST STEP IN AIR POLLUTION CONTROL. Instrument Development Co., Reston, Va. Feb. 1, 1967. 27 pp.

This paper was prepared in order to contribute to the better understanding of the need for air contaminant monitoring. Included are explanatory remarks on the Clean Air Act of 1963, some historical considerations on air pollution, lists of sources pollutants, and specifications on air pollution monitoring equipment currently offered by the Instrument Development Company.

05419

Sinsheimer, R. F., Jr., R. J. Ciancimino, F. R. Ward, and D. A. Brennan

DIGITAL DATA ACQUISITION AND COMPUTER DATA REDUCTION FOR THE CALIFORNIA EXHAUST EMISSION TEST. In: Vehicle Emissions, Part II, SAE Progr. in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., N.Y. 1966, p. 143-151. (Presented at the SAE Mid-Year Meeting, Detroit, Mich., June 6-10, 1966.)

The tedious, time consuming task of hand reducing data from the California exhaust emission test has been alleviated through the use of digital data acquisition equipment and a digital computer. Analog signals from exhaust gas analyzers and an engine speed transducer are converted to digital measurements which are recorded on tape and submitted to a digital computer for data analysis and computation of results. In the data analysis, the computer identifies the required driving modes from engine speed changes, taking into account the sample delay time. "Reported" composite emissions determined by the automatic data reduction method agree within 5% with results determined by careful hand analysis of analog strip chart recordings. The results determined by the automatic data reduction system are more consistent and accurate because of human errors prevalent in hand analysis have been eliminated, and because nonlinear analyser response is accounted for. With the automatic system, data reduction time has been decreased from about 8 hr per test to less than 1 minutes. (Authors' abstract)##

05476

Krustalev, V. A.

DETECTION OF PHENOL IN THE ATMOSPHERE WITH 4-AMINOANTIPYRENE. Gigiena i Sanit. 10, 82-5 (1962). Russ. (Tr.)

In the detection of phenol by the use of 4-A.A.P. (4-aminoantipyrene), it was established that dimethyl p-cresol, acetophenone, alpha-methyl-styrene, diethyl ether, isopropyl alcohol, hydroperoxide of isopropyl benzene, benzene, dimethyl phenylcarbinyl, ethyl- and butyl-benzine do not interfere. In the detection of phenol with diazotized p-nitroaniline, presence of dimethyl p-cresol interferes to the extent of 0.7 microgram which attests to the expediency of the use of the 4-A.A.P. and not of the diazotized p-nitroaniline. The absorption of phenol from air can be achieved by liquid media or solid sorbent. The use of 0.05 M solution of sodium borate, of which 3 or 5 ml. should be put into a Y-shaped absorber with a No. 1 porous membrane is recommended for liquid media. It is possible to carry out the liquid media absorption of phenol at a speed of 5 L/min. Silica gel in suspension was used as the solid absorbent. Absorption rates for complete absorption here were 5-10 L/min. The use of ethyl alcohol effected complete extraction of the phenol from the silica gel in 15 min. Results of these studies are presented in diagram. The rose color of the sample in the 0.1 percent aqueous 4-A.A.P. solution was compared with the standard curve.

05383

Krilov, N. A.

DETERMINATION OF ETHYLENE OXIDE IN THE ATMOSPHERE. Gigiyena i Sanit. 10, 58, 1961. Russ. (Tr.)

A colorimetric method was developed for the estimation of ethylene oxide in the atmosphere, based on the hydration of ethylene oxide to the ethylene glycol and its subsequent oxidation by periodic acid or potassium periodate to formaldehyde and the determination of the latter with chromotropic acid. The sensitivity of the method is 0.000 5 µg. in 5 ml. It is recommended that ethylene oxide be sampled in 6 ml. of 60 percent H_2SO_4 contained in a U-shaped absorber with a No. 1 porous membrane at a speed of 0.5 l/min. (Author conclusions modified)

05404

E. J. Levy and D. G. Paul

THE APPLICATION OF CONTROLLED PARTIAL GAS PHASE THERMOLYTIC DISSOCIATION TO THE IDENTIFICATION OF GAS CHROMATOGRAPHIC EFFLUENTS. J. Gas Chromatog. 5 (3) 136-45, Mar. 1967.

A technique has been developed for gas chromatographic effluent identification. In the application of this technique, the peak selected for identification is transferred in a continuous flow system, from the primary gas chromatographic unit, through a tubular quartz pyrolysis reactor, and then through a second gas chromatograph for identification of the pyrolysis products. The pyrolysis patterns obtained are characteristic of the parent compound, independent of sample size and constant for the standard pyrolysis condition. Under these standard conditions, the pyrolysis product distribution may be treated in a manner analogous to the mass spectral ion distribution reported as a percentage of total ionization. The pyrolysis product distribution obtained using hexadecane as a test compound agreed very closely with the distribution predicted by the modified Rice free radical mechanism for thermal dissociation. (Authors' abstract, modified)

05456

Roschig, H. and Ratschiner, H

INVERSE POLAROGRAPHIC DETERMINATIONS OF TRACES OF LEAD IN MIXTURES OF TECHNICAL HYDROCARBONS. Inversepolarographische Bestimmung von Bleispuren in Technischen Kohlenwasser-Stoffgemischen. Chem. Tech. (Berlin) 19(2):103-104, Feb. 1967. Ger.

A method is described in which lead in benzene in concentrations of 1 to 100 ppb can be determined. After reducing the tetraethyl lead with bromine, the lead is extracted with 0.1N HNO_3 and determined in an inverse polarographic cell. The threshold of detection of 0.8 ppb of lead depends on the purity of the reagents used. The method is fast, requiring about 45 min. with a standard deviation of plus or minus 7 percent.

05461

Y. Suzuki and H. Matsushita

THIN LAYER CHROMATOGRAPHIC SEPARATION OF POLYNUCLEAR HYDROCARBONS ON THE PLATE COMPOSED OF TWO ADSORBENT LAYERS. Ind. Health, (Japan) 4, (3) 109-17, Oct. 1966.

In thin layer chromatography, the band width of a sample applied to a plate is one of the most important factors affecting the efficiency of separation of a sample. A new method is described to narrow and to separate adequately a band of a mixture of polynuclear hydrocarbons applied to a chromatoplate composed of two adsorbent layers by means of a chromatocharger. One layer of of the chromatoplate is used to narrow a band of sample applied to a plate and the other is used to separate the narrow band into several bands corresponding to each hydrocarbon. A successful separation of polynuclear hydrocarbons is obtainable by thin layer chromatography using 25% acetylated cellulose-aluminum oxide G plate, silica gel WOELM-cellulose plate, and aluminum oxide G-cellulose plate. By using this method, a mixture of several hydrocarbons in 10 ml of dilute solution can easily be separated into the separate hydrocarbons without further concentration. (Author summary, modified)**

05501

G. J. Cleary

NATURE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR PARTICULATES (A REPORT OF SOME OBSERVATIONS IN THE SYDNEY AREA). Proc. Clean Air Conf., Univ. New South Wales Vol. 1, 14p. 1963, Paper J.

Procedures are described for the separation and characterisation of polynuclear hydrocarbons in air borne particulates and related samples. The basic method involves chromatographic separation using activated alumina columns considerably longer than usually encountered. This factor, coupled with careful elution, enables quite good separation to be achieved in the column itself. Ultraviolet spectral analysis is then used as a means of characterising the samples whilst mixed fractions and trace quantities, after concentration, may be rechromatographed on acetylated paper. Among the compounds identified or characterised were acenaphtene, phenanthrene, anthracene, pyrene, fluoranthene, 1,2 benzfluorene and 2,3 benzfluorene, chrysene, 9,10 benzpenanthrene, 3,4 benzpyrene and 1,2 benzpyrene, 2,3 benzfluoranthene, 1,12 benzperylene, anthanthrene and coronene. (Author abstract)**

05502

M. Katz J. L. Monkman

THE ORGANIC FRACTION OF PARTICULATE POLLUTION, INCLUDING POLYCYCLIC HYDROCARBONS. Proc. Clean Air Conf., Univ. New South Wales, Vol. 1, 25p., 1962, Paper 3.

Seasonal variation in content of organic material in urban atmospheres shows the anticipated high winter low summer trend. The constitution of the extremely complex organic media besides differing with source, depends upon possible photochemical, catalytic oxidation and polymerisation reactions in the atmosphere. Solid fuel burning equipment is the most prolific source of aromatic polycyclic hydrocarbons. Suggestions have been made for utilising the concentration ratios 3,4 benzpyrene/coronene and 3,4 benzpyrene/1, 12 benzperylene as indicative of pollution from coal burning plant or automobile exhaust, however, extensive tunnel tests have shown that the contribution of efficiently operated internal combustion engines is less than expected. It should be stressed that the separation and determination of polycyclic constituents is a complex and delicate investigation and cannot be considered routine research. There is still a need for complete classification of aromatics and other hydrocarbons, phenols, quinones, nitrogen derivatives and other organics. Moreover, new and quicker methods of biological appraisal of potentially cancerous air contaminants are long overdue. (Author abstract)##

05536

Brocring, L. C. Jr.; Werner, H. J.; Rose, A. H. Jr.

AUTOMOTIVE MASS EMISSION ANALYSIS BY A VARIABLE DILUTION TECHNIQUE. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-15, 1967, Paper 67-200.)

The objective of this study was to develop an improved method for measuring engine exhaust, to be used both for compliance testing and for the design and development of new engine-emission-controls. The variable dilution sampling technique was chosen for the system. The operation of this systemincludes collection and simultaneous dilution of the total-exhaust volume with a variable volume of dilution air, such that the total mass flow rate of exhaust gas plus diluent air is constant for a given unit of vehicle operation. Measurement of contaminant concentration in the exhaust-diluent air mixture provides direct measurement of the mass of contaminants discharged per unit operation of the vehicle. For continuous mode mass emission measurements, samples are withdrawn continuously after the sample pump. Carbon monoxide, carbon dioxide, hydrocarbons, and oxides of nitrogen are measured by the standard exhaust measurement techniques. The practical capabilities of the variable dilution system to measure auto exhaust emissions during cyclic operation, were evaluated by comparing the mass-emission levels indicated by this system to those obtained with the proportional sampler. Tom determine the response characteristics of the system under continuous sampling conditions, known

quantities of butane were injected at the inlet of the sampling system, and the response of the hydrocarbon (NDIR) instrument was recorded. The response time of the total system, including that attributable to the analytical instruments, compared favorably to that obtained with the instrument train specified in both the current Federal and the California Exhaust Emission Standard Procedures. In summary, the variable dilution sampling technique possesses 2 distinct advantages over present emission testing procedures: (1) The technique is simple, practical, and accurate for the direct measurement of vehicle-exhaust mass emissions. (2) The rapid and highly sensitive response characteristics of the system to changes in mode mass-emission levels establish its usefulness as a design and development tool.

05561

R. D. Stewart and D. S. Riley

DETECTION OF VOLATILE ORGANIC COMPOUNDS AND TOXIC GASES IN HUMANS BY RAPID INFRARED TECHNIQUES. Progr. Chem. Toxicol. 2, 181-220 (1965).

Advances in infrared analytical techniques and sampling accessories have permitted the development of methods for detecting toxic gases and volatile organic compounds in the expired breath, blood, urine, and tissues. Inherent in these infrared techniques are the desired specificity, sensitivity, speed, and simplicity. Infrared analysis of the expired breath may be used effectively to detect the following groups of compounds: (1) the halogenated hydrocarbons, such as carbon tetrachloride, trichloroethylene, and methylene chloride; (2) the alcohols, such as methanol, ethanol, and isopropanol; (3) the ethers and aldehydes, such as ethyl ether and paraldehyde; (4) the ketones, such as acetone and methylethyl ketone; (5) gases such as carbon monoxide, carbon dioxide, and ammonia. Infrared techniques for the determination of carbon monoxide in the exhaled breath are faster and more sensitive than the standard carboxyhemoglobin determination. Solvent extractions of body fluids may be analyzed by infrared for the following groups of compounds: (1) the halogenated hydrocarbons; (2) the alcohols; (3) the ethers and aldehydes; and (4) the ketones. Infrared analysis of body fluid extracts has proved valuable in the fields of toxicology, industrial and forensic medicine, and pharmacology. The infrared identification of any compound ultimately depends on the comparison of its spectrum with that of a standard of known purity. While it is true that the spectrum itself will often reveal much information about the functional groups present, specific identification and quantitative analysis always require comparison with a standard spectrum. It is essential, therefore, to have a reference file of the spectra of pure materials, and some means for reaching this file efficiently.##

05572

Scott, W. E. and E. R. Stephens

A SCIENTIFIC APPROACH TO THE PROBLEM. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa.; pp. 29-35 (1956)

Chemical reactions that take place in a polluted atmosphere produce substances that lend smog its eye-irritating, crop-damaging, visibility-lowering characteristics. The authors relate how, in an effort to identify these reactions and substances, the staff devised the long-path (up to 500 meters) infrared absorption cell. They describe the construction of the cell, and how it is used to detect and "fingerprint" the products of photochemical reactions, both in synthetic and in actual smog. Early work with this new tool was pointed to explaining the characteristic high ozone concentrations of smog, and proceeded from Dr. Haagen-Smit's evidence that nitrogen dioxide reacted with organic compounds in air to produce ozone. They trace the nitrogen dioxide studies that finally led to discovery of Compound X (peroxyacyl nitrite), believed to be the "missing link" in the process of ozone formation in smog. Gasolines and auto exhaust as sources of organic pollutants that take part in NO_2 reactions are discussed. They relate their plans for further studies with the infrared cell, and the possibility of applying Los Angeles smog research to other afflicted cities. It may appear that the work reported here is concerned solely with the Los Angeles problem. This is partly true because there air pollution problems in some cities which involve pollutants and weather conditions entirely different from those of Los Angeles. On the other hand, however, many large cities do have pollution sources of the same kind as Los Angeles: power plants, refineries and other industry, incinerators, automobiles, etc. The results of studies of reactions of pollutants from these sources are valid regardless of the city. Weather conditions and topography in the Los Angeles area are such that the products of reactions in the atmosphere frequently accumulate and result in damage and irritation. While conditions for the accumulation of these products occur less frequently in other cities, nevertheless they do occur and the resulting smog is objectionable and costly. With an inversion and no wind, we have a good trap for pollutants from these sources, and as good a chance of having smog as Los Angeles. Plant damage is reported in areas surrounding most large cities of the world. Los Angeles studies show that there are other pollutants besides coal smoke and SO_2 that may be objectionable, especially in and around large cities.##

055?8

H. W. Patton and J. S. Lewis

FRACTIONATION AND ANALYSIS OF A MICRO SCALE BY GAS CHROMATOGRAPHY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955 pp. 74-8.

The work reported in this paper concerned a study of the usefulness of gas chromatography for the separation, isolation, and identification of the components of a complex mixture. Automobile exhaust gas was chosen as the source of samples because of its ready availability and its importance in air pollution studies. The objective was not to obtain a complete analysis but to discover some of the potentialities of the method alone and in combination with other methods.##

05581

R. F. Austin

AN EXPERIMENTAL INSTRUMENT FOR THE CONTINUOUS MEASUREMENT OF THE CONCENTRATION OF OLEFINS IN AIR. Proc. Natl. Air Pollution Symp., 3rd Pasadena, Calif., 131-5 (1955).

The principles of electrolytic generation of bromine and reaction of this reagent in the gas phase at high temperature in a contact bed with olefin have been studied and proved practical as the basis for a continuous record of the concentration of olefins in the atmosphere and in such sources of emission as exhaust gases. An experimental model of a recording instrument of this kind has been developed and successfully operated with manual control of sample gas. Work is in progress to complete the instrument development and carry out field tests.##

05605

Boubel, R. W. and L. A. Hipperton

BENZO(A)PYRENE PRODUCTION DURING CONTROLLED COMBUSTION. J. Air Pollution Control Assoc., 13(11):551-557, Nov. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A statistical experimental design was initiated to determine if the quantitative production of benzo(a)pyrene during combustion could be related to some of the variables of the combustion process. Four fuels of different molecular structure, but the same carbon number, were chosen. These were benzene, cyclohexane, hexene-1, and hexane. Three air-fuel ratios were selected: the richest and leanest practical mixtures plus one intermediate. The combustion was investigated with and without the effects of flame quenching by a cooled surface in the combustion chamber. Choice of these levels of variables led to the establishment of a program containing 72 treatments (4 fuels x 3 energy levels x 3 A/F ratios x 2 cooling levels = 72 runs). The apparatus was constructed around a surplus truck preheater. This heater was a gasoline-burning type equipped with electric ignition, a forced draft combustion air system, and a vaporizing pot-type burner. Sample analysis was carried out spectrophotometrically utilizing the variable reference technique of Jones, Clark and Harrow. The results confirm previous work by others who have shown measurable benzo(a)pyrene production during incomplete combustion. The statistical method of this experimental design was very efficient for indicating the significant differences of the variables and magnitude of these differences. The curvilinear regression equations can be used in any future work with this system to predict the mean value of benzo(a)pyrene produced by any combination of the variables used in this experiment. The fact that the benzo(a)pyrene can be minimized for any one fuel used in the apparatus is highly significant. The procedures used in this study can be applied to any combustion process to determine the effects of the system parameters on the quantity of benzo(a)pyrene produced, and can be adapted for use in field studies and utilized to predict the quantity of this carcinogen emitted by each of the many sources contributing to its atmospheric concentration.##

05617

Morris, R. A. and R. L. Chapman

FLAME IONISATION HYDROCARBON ANALYZER. (J. Air Pollution Control Assoc., 11(10):667-669, Oct. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The empirical basis for the flame ionisation method is the observation that while the flame of pure hydrogen contains an almost negligible number of ions, the addition of even traces of organic compounds produces a large amount of ionisation. In practice, the sample to be analysed is mixed with a hydrogen fuel and passed through a small jet. Air is supplied in the annular space around the jet to support combustion. Any hydrocarbon carried into the flame results in the formation of ions which are accelerated to a collector electrode by an electric field set up between the jet and electrode. The generated ion current is proportional to the rate the hydrocarbon molecules are introduced into the flame. If flow rates are held constant, the ion current is proportional to hydrocarbon concentration. It has been found empirically that the ion current produced in the hydrogen flame is proportional to the heat of partial combustion of the sample (to CO2 and H2O). Therefore, it is possible to construct a table showing the approximate relative contribution which carbon atoms in aliphatic, aromatic, olefinic, acetylenic, and carbonyl molecules will make on the observed signal. Such a table is included. The hydrocarbon analyzer is ideally suited to instrumentation for auto exhaust inspection. In general, it can be used to determine the presence of total hydrocarbons in inert or inorganic gases such as He, A, N2, H2, and air. Determinations of carbon content in concentrations from 0.1 ppm to 25% are possible with excellent discrimination against water, CO, CO2, and other inorganic gases. The instrument gives equivalent sensitivity for various hydrocarbons, thus it is not selective for mixtures of organic compounds.##

05634

R. Feldstein

STUDIES ON THE ANALYSIS OF HYDROCARBONS FROM INCINERATOR EFFLUENTS WITH A FLAME IONIZATION DETECTOR. (J. Air Pollution Control Assoc.) 12, (3) 119-41, Mar. 1962. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Flame ionization units capable of detecting small concentrations of hydrocarbons make use of the principle that when a hydrocarbon is introduced into a hydrogen flame, electron concentrations are formed and can be measured. The thermionic work function for carbon is 4.35 electron volts which, apparently, is low enough for electron emission at hydrogen flame temperatures. The response of the instrument is proportional to the number of carbon atoms in the compound being burned; that is, hexane will give six times the response of methane. The instrument can thus be considered as a carbon counter. Apparatus and equipment included a Varad flame ionization analyzer and detector,

recorder, a Carad gas sampling unit, and stainless steel collecting tanks. A 10 ml sample of effluent was injected and yielded a reading proportional to the total hydrocarbon content of the sample. A second 10 ml sample was then injected with the silica tube in line. Response due to methane, ethane, ethylene, and acetylene was then noted on the recorder as these gases separated on the silica column. The difference between the total hydrocarbon reading and the methane reading is proportional to the C2-C6 hydrocarbons present in the sample. The same samples were also analyzed by gas chromatography. By converting the results obtained with each method to similar units, direct comparison may be made. For the series of effluents analyzed, agreement between the two methods is excellent. The flame ionization method with adsorption properties of particle and surface. Adhesion of provides a more rapid procedure for the analysis and may be considered as a comparable method for the analysis of C2 and higher hydrocarbons.##

05616

H. F. Clark

EVALUATION OF MICROBIOLOGICAL SYSTEMS FOR ESTIMATING AIR POLLUTING SUBSTANCES. Preprint. (1957).

The procedure used in the evaluation of microbiological systems for estimating air polluting substances consisted of: (1) Placing an indicator organism on a membrane filter strip in a logarithmic increasing concentration; (2) Exposing the bacterial indicator on the surface of the strip to a synthetic aerosol (irradiated automobile exhaust) at a flow rate for the aerosol of 5/min with the strip moving 7.8 cm/sec; (3) cultivation of the remaining viable bacteria on the strip after aerosol exposure by incubation on an appropriate medium at 35C for 18-20 hrs; and (4) Comparison of the bacterial colony density on the exposed strip with suitable control strips to estimate the growth inhibiting property of the aerosol under examination. A recently isolated B. coli, was used as an indicator. The procedure appears to have valuable application in the study and comparison of exhaust before and after irradiation. The concentrations of hydrocarbons in some of the experimental tests were in the range of those which might occur on a street during heavy motor vehicular traffic. The test procedure has sufficient merit to justify further development work on methodology, interpretation and application.##

05617

E. M. Ciepliński and L. S. Stiro

A NEW SIMPLIFIED DETECTOR FOR THE ANALYSIS OF ORGANIC IMPURITIES IN ATMOSPHERE AND EXHAUST GASES. Preprint. (Presented at the Joint Symposium on Air Pollution Instrumentation, Instrument Society of America and Air Pollution Control Association, New York City, June 12-13, 1961.)

The Model 221 Flame Ionization Analyzer is a 117-volt, 60-cps, line-operated instrument. It measures 10 1/4 inches on a side and weighs about 25 pounds. A meter located on the front of the instrument indicates the organic vapor concentration of the sample. Since different classes of organic compounds give a different detector response, the meter indication for a given sample must be interpreted on the bases of instrument calibration with an appropriate test gas. Output connections are provided for using the instrument with a standard 0-5 or 0-10 millivolt, potentiometer recorder. Hydrogen, air, test gas, and zero gas supplies are necessary for operation. Filters containing 5-A Molecular Sieve mus should be used to remove any small impurities present in the air and hydrogen. The test gas contains a known concentration, in the same order of magnitude as the sample, to permit the proper calibration of the panel meter. The zero gas is the same as the background gas of the sample and is usually only necessary when the higher sensitivity ranges are being used. The gas is used to check and eliminate any effect the background gas may have on the flame detector operating parameters. The instrument will continuously monitor organic impurities in the atmosphere and exhaust gases. The unit is transportable, line-operated, and is very stable. Samples may be introduced in the range of 15-75 millimeters of mercury pressure when external regulation is used and between 0.4-0.5 liters per minute when the instrument's back pressure regulator is used. The linearity of response for the detecting system has been shown to be very good over a wide range of concentrations ##

05046

R. Goldstein and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 5, DEVELOPMENT OF SAMPLING AND ANALYTICAL METHODS.) Los Angeles County Air Pollution Control District, Calif. Mar. 1960. 44 pp.

Analytical methods have been developed for the determination of low concentrations of solvent vapors emitted from protective coating operations. Organic compounds are detected and determined as CO2 in a nondispersive infrared CO2 analyzer after combustion. A chromatographic apparatus has been constructed to be used in conjunction with the combustion-infrared CO2 analyzer to determine low concentrations of organic vapors as CO2 in the presence of background concentrations of CO2 as high as six %. The development of a chromatographic procedure for the complete separation and quantitative determination of individual compounds in an effluent containing solvent vapors is in progress. (Author abstract) ##

05063

L. S. Ettre

APPLICATION OF GAS CHROMATOGRAPHIC METHODS FOR AIR POLLUTION STUDIES. J. Air Pollution Control Assoc.

11 (1), 38-41 (Jan. 1961). (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The modifications of conventional gas chromatography apparatus are described which allows the use of gas chromatography in air pollution studies. The newest developments of supersensitive chromatography are described with special respect to their importance in trace analysis. The construction, and operation of a new instrument based on the flame ionization principles is detailed. (Author summary)**

05951

Alekseeva, N. V.

METHODS FOR THE DETERMINATION OF ATMOSPHERIC POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants, Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 107-31. (1962). Russ. (Tr.)

Development in the synthesis of high molecular compounds resulted in the production and utilization of many new organic substances by the USSR national industries. Plants producing these substances and their intermediate products discharge into the air gases, vapors and by-products as surrounding atmospheric air pollutants the detection and quantitative determination of which require special and highly sensitive analytical methods. Methods are described for the detection of acetic acid esters, acetates, dinyl, isopropylbenzene, furfurol, ethylene oxide, monobasic carbonaceous acids, methylmetacrylate, dimethylformamide, and isopropylbenzene hydroperoxide. An index of allowable concentration limits for hazerful substances in atmospheric air of inhabited areas is appended.

05952

Ryssanov, V. A.

A SUMMARY OF 1961 STUDIES IN THE FIELD OF LIMITS OF ALLOWABLE CONCENTRATIONS OF ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants, Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 110-91. (1962). Russ. (Tr.)

The Committee for the Sanitary Protection of Atmospheric Air approved limits of allowable concentrations in the air for the following new substances: furfurol, dimethylformamide and styrol. Furfurol is a heterocyclic aldehyde which is a good solvent for many organic substances used in the preparation of some plastics and a selective solvent for the purification of crude oil lubricants. The threshold of aldehyde odor perception in most sensitive persons was established at 1 mg/cu m. It was determined that 0.05 mg/cu m of furfurol constituted the subthreshold concentration in all the tests employed. Therefore, 0.05 mg/cu m of furfurol was accepted as the maximal single allowable

concentration. Styrol is a benzene homologue with one double bond at its side chain. The maximal single allowable concentration of styrol in the atmospheric air was suggested as 0.003 mg/cu m. Dimethylformamide is a colorless liquid having a nauseating herring odor; it is used as a polyacrylonitryl solvent in the synthetic fiber industry known as orlon and nitron. It was recommended that 0.01 mg/cu m be adopted as the limit of allowable single and 24 hour concentration of dimethylformamide vapor in the air, since it proved to be the subthreshold concentration in relation to all the test indexes. The limit of allowable phenol concentration in atmospheric air was set at 0.01 mg/cu m. Rats were exposed to the inhalation of nitrogen dioxide 6 hours daily for 160 days at different dose levels. No maximum allowable concentration was agreed upon.

05959

Alekseeva, M. V. Tkachev, P. G.

METHODS FOR THE DETERMINATION OF SOME ORGANIC ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants, Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 203-12, (1963). Russ. (Tr.)

Methods are described for the determination of aniline, xylol, n-butyvinyl ester and dimethylterephthalate in the atmosphere. Standard color scales are also included for the quantitative determination of xylol, n-butylvinyl ester and dimethylterephthalate (DMTPH). A method for the determination of phenol with 5-aminoantipyrine is described and standard color scales for the quantitative determinations are included.

05961

Cantuti, V., G. P. Cartoni, A. Liberti, and A. G. Torri

IMPROVED EVALUATION OF POLYNUCLEAR HYDROCARBONS IN ATMOSPHERIC DUST BY GAS CHROMATOGRAPHY. J. Chromatog. 17, (1) 60-5, Jan. 1965.

In the investigation of the application of gas chromatography to the determination of polynuclear hydrocarbons in airborne particles new liquid phases were evaluated and programmed temperature chromatography was used. An electron capture detector was used for the determination of polynuclear hydrocarbons. Its relative response was compared with results obtained with a hydrogen flame ionization detector. It is shown in one of the chromatograms of an atmospheric dust sample that the response of the electron capture is very different from that of the flame and at the same time shows many other unknown compounds as large peaks that are not detected by the flame detector because of being present in too small an amount.

06008

D. J. Morgan and G. Duxbury

THE DETERMINATION OF CHLORINATED HYDROCARBONS IN THE ATMOSPHERE BY ACTIVATION ANALYSIS. Ann. Occupational Hyg. (London) 8(3):251-256, July 1965.

The maximum allowable concentration for continuous exposure to trichlorethylene varies by a factor of ten depending on the country in which it is used; in this country it is variously quoted as 100 ppm or 200 ppm but recent studies (Morgan, 1964) have suggested that these values may be too high. A limited experimental programme using neutron irradiation was undertaken to examine its potentialities and to demonstrate its utility in the field of industrial hygiene. The air samples are drawn through charcoal, which is then irradiated in a thermal neutron flux, where Cl-38 is formed; this then decays with a half-life of 37 min, emitting gamma-radiation of energies 1.60 and 2.15 MeV. The amount of Cl-38 is then determined by spectrometry. A series of measurements was carried out in a well-ventilated room in which a degreasing tank was situated. Concentrations less than 10 ppm of trichlorethylene were generally found in the room air during the day. A sampler operated at a height of 5 ft above ground level, near the side of the tank, indicated a concentration of about 20 ppm averaged over the whole day.##

06021

W. Stanilewicz and S. Mirowska

(THE USEFULNESS OF THE NEPHELOMETRIC METHOD FOR BENZENE AND OIL DETERMINATION IN THE AIR. (Przydatnosc metody nefelometrycznej do oznaczania benzyny i nafty w powietrzu.) (Med. Pracy (Lodz) 16 (3), 223-9 (1965). Pol.

Nephelometric methods for the determination of benzene and oil concentration in air were investigated. Detection methods, standard scale range, the effect of the addition of water on turbidity, and the durability of oil and benzene solution in glacial acetic acid were studied. The method of Zapolsky and Wormwobine and that of Pierequd are not considered suitable for the determination of benzene concentrations in air because the resultant values are too low.##

06025

A. L. Linch, H. H. Davis, H. F. Stalser, and W. F. Anzilotti

STUDIES OF ANALYTICAL METHODS FOR LEAD-IN-AIR DETERMINATION AND USE WITH AN IMPROVED SELF-POWERED PORTABLE SAMPLER. Am. Ind. Hyg. Assoc. J. 25(1):81-93 (Feb. 1964). (Presented at the

Annual Meeting, American Industrial Hygiene Association, Cincinnati, Ohio, May 10, 1961.)

The portable "Uni-Jet" Lead-in Air Analyser was revised to provide constant rate collection of tetraethyl (TEL) and tetramethyl lead (TML). Reliable results from monitoring leaded gasoline storage tanks, cleaning and decontamination procedures, were obtained by drawing a two-cubic foot sample during twenty minutes through methanolic iodine. The aspirating unit powered by nonflammable "Freon-12" has been used widely in fire and explosion hazard areas. (Authors' abstract)##

06050

D. F. Adams

OZONE ANALYSIS WITH THE MINI-ADAK II. J. Air Pollution Control Assoc. 13, (2) 88-90, Feb. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The suitability of sodium diphenylamine sulfonate (NaDS), potassium iodide, and phenolphthalein reagents for ozone analysis in a multipurpose, automatic analyzer such as the Mini-Adak II was investigated. The oxidation potential for NaDS is more negative than that for iodine and, therefore, NaDS is believed less susceptible to oxidative interference as a colorimetric reagent. The reagents were prepared along with a mixture of ozone and oxides of nitrogen. The test atmosphere was drawn through a single manifold and thence to two midget impingers in parallel, one containing 10 ml of the neutral KI reagent and the other 10 ml of either the NaDS or phenolphthalein reagent. A second series of comparisons was made between a midget impinger containing neutral KI and the Mini-Adak II utilizing the NaDS or phenolphthalein reagent. Based on the literature and the work herein reported, either the phenolphthalein or NaDS reagents can be used in the Mini-Adak for ozone analysis. Selection of the reagent to be used should be based upon an evaluation of the possible interferences which may be present with ozone in the atmosphere and the relative sensitivities (molar absorbancy) of the two reagents. Either reagent shows only one-fourth as much response to NO2 neutral KI and is therefore superior to KI in this respect. Based on the laboratory study, the phenolphthalein reagent appears somewhat preferable for use in the Mini-Adak. This selection is tentatively made upon the basis of the greater sensitivity (molar absorbancy) of the phenolphthalein which permits the use of a lower Mini-Adak sensitivity range with its attendent reduction in electronic background noise.##

06052

J. L. Jones, R. A. Schuck, R. W. Eldridge, R. Endow, F. W. Evans

MEASUREMENT OF AUTOMOBILE EXHAUST GAS HYDROCARBONS. J. Air Pollution Control Assoc. 13, (2) 73-7, Feb. 1963. (Presented

at the 150th National Meeting, American Chemical Society, Chicago, Ill., Sept. 3-8, 1961.)

The purpose of the study was to compare hydrocarbon analyses obtained with a non-dispersive infrared analyser and those obtained by other instruments. Automobile exhaust was examined with a dispersive IR analyser, with a flame ionization hydrocarbon detector, and gas chromatographs. As a part of this study, the methods of handling automobile exhaust gases were also examined. Dispersive IR analyses were performed using a Perkin-Elmer Model 21 spectrophotometer equipped with 40-meter gas cells and a scale expander. The nondispersive IR hydrocarbon analyser essentially measures the saturated hydrocarbon fraction of the total hydrocarbon concentration in exhaust. Since the ratio of saturated to unsaturated components in exhaust is not constant, the hydrocarbon concentrations obtained with this instrument are not necessarily proportionate of the total hydrocarbon concentration in the exhaust. Specifically, this instrument is insensitive to certain short-chain unsaturated aliphatic hydrocarbons which are the principal reactants in photochemical smog. Thus, this instrument could indicate that an exhaust was relatively free of hydrocarbons when in reality it contained high concentrations of smog precursors. The flame ionization hydrocarbon detector, the IR spectrophotometer, and the gas chromatograph can measure most of the hydrocarbon components in exhaust. Using the flame ionization hydrocarbon detector in conjunction with the n-hexane-sensitized nondispersive infrared analyser prevents erroneous conclusions concerning hydrocarbon concentrations. If the flame ionization hydrocarbon detector measures the total hydrocarbon concentration in the exhaust and the nondispersive infrared instrument measures saturated hydrocarbons, then the difference between the concentrations will provide a rough measure of the unsaturated hydrocarbons (plus methane) in an exhaust. In analyses of exhaust gas hydrocarbons, the method of direct 5:1 dilution of the hot exhaust gas with nitrogen gas, followed by parallel analysis with the nondispersive IR and flame ionization instruments, is suggested in preference to the method utilizing condensate traps, or heated exhaust sampling.##

06065

V. Levin, H. W. Hippoldt, and H. L. Robertus

SPECTROPHOTOMETRIC DETERMINATION OF PRIMARY AROMATIC AMINES WITH THIOTRITHIAZYL CHLORIDE (APPLICATION TO DETERMINATION OF TOLUENE-2, 5-DIISOCYANATE IN AIR). Anal. Chem. (U.S.) 39(6):581-586, May 1967.

Highly colored intermediates form during the reactions of thiotrithiazyl chloride with some primary aromatic amines. The molar absorptivities range from about 21,500 liters/mole cm for the red product from m-phenylenediamine to about 100 liters/mole cm for the green product from aniline. Rapid color development is achieved at room temperature either by direct combination of solid thiotrithiazyl chloride with a solution of the amine in methanol-chloroform, or by percolating the amine solution over a bed of thiotrithiazyl chloride mixed with dry sand. Although the colored species generally decompose within a few minutes, linear

calibration curves are readily obtained by controlling reaction conditions. These observations have been applied to the determination of airborne toluene-2,4-diisocyanate at concentrations as low as 0.01 ppm by volume. (Author abstract)##

06070

M. M. Rockind

INFRARED ANALYSIS OF MULTICOMPONENT GAS MIXTURES. Anal. Chem. 39, (6) 567-84, May 1967. (Presented at the 153rd National Meeting, American Chemical Society, Miami Beach, Fla., Apr. 9-14, 1967.)

A new method for the infrared analysis of multicomponent gas mixtures which involves a condensed phase sampling technique employing commercially available cryogenic equipment is described. Only a few micromoles of material are required for positive qualitative identification of most chemical species; hence, the method is sensitive and suitable for impurity analysis. The technique is very general in its applicability. Structurally similar molecules are readily differentiated, and molecules differing only in isotopic content may sometimes be distinguished. Molecules are characterized by a small number of well defined frequencies. The method permits analyses to be executed rapidly and is capable of creditable quantitative results. Herein spectral analyses are demonstrated for a series of 13 C(1) - C(9) hydrocarbons. (Author abstract)##

06117

Yada, O.

MEASUREMENT OF AIR POLLUTANTS. Bunseki Kagaku (Japan Analyst) (Tokyo) 2p. 1108-78, 1966. Jap.

Important papers published in Japan Analyst in 1964 and 1965 are summarised. The subject is limited to measurement methods of air pollutants known to be toxic to health. Pollutants from stacks and automobile exhausts are covered, including many cyclic hydrocarbons, aldehydes, sulfur oxides, nitrogen oxides, ozone, carbon monoxide, carbon dioxide, fluorine compounds, hydrogen sulfide, lead compounds, and offensive odors. Various sampling methods are described, especially using filtering with glass wool filters, electric dust collectors, gas absorbers, and portable samplers containing silica gel. The pollutants can be measured by electroconductivity methods, colorimetric measurement recorder, gas chromatographic analysis, electron capturing detector, and hydrogen ion detector. The papers summarized do not include those dealing with industrial or occupational environment or mining.

06135

Cleso, G. M.

SOME CONSTITUENTS OF CITY SMOKE. Tetrahedron 23, (5) 2189-91, May 1967.

An interest in the complementary action of cigarette smoke and the neutral constituents of city smoke prompted this study of the isolation and identification of the aromatic hydrocarbons collected on cotton filters through which air had been drawn for 10-12 weeks. Chromatography on an alumina column of the neutral portion of the atmospheric soot which had been eluted from the cotton filters with a light petroleum gave a number of nitrogen-free hydrocarbons from which the crystalline 1,3,5-trinitrobenzene complexes were prepared. Identification was based on infrared, ultraviolet, and mass spectrometry as well as on the melting points. Pyrene, 3-methylpyrene, 1,2-benzpyrene, triphenylene, chrysene, 1,12-benzperylene, and picene were isolated and identified. The 3,4-benzpyrene was identified, but not the non-aromatics which formed the bulk of the neutral portion. Mass spectrometry showed that the most volatile fraction of the light petroleum extract contained a series of 10 compounds with molecular weights from which a base, $C_{13}H_{15}N$, has been isolated.

06200

Stanley, Thomas W., James E. Meeker, and Myrna J. Morgan

EXTRACTION OF ORGANICS FROM AIRBORNE PARTICULATES: EFFECTS OF VARIOUS SOLVENTS AND CONDITIONS ON THE RECOVERY OF BENZO(A)PYRENE, BENZ(C)ACRIDINE, AND 7H-BENZ(DE)ANTHRACEN-7-ONE. Environ. Sci.Technol., 1(11):927-931, Nov. 1967. 20 refs. (Presented at the 153rd National American Chemical Society Meeting, Miami, Fla., April 9-14, 1967.)

Recently developed spectrophotometric and spectrophotofluorimetric methods of analysis for several known carcinogens were applied in studies of extraction efficiencies of solvent systems used to obtain the organic fractions of airborne particulates. Some of the solvents investigated were pentane, benzene, cyclohexane, acetone, diethyl ether, methylene chloride, and benzene: diethylamine (9:1, V/V). Weights of organic extracts from known weights of carefully compositied air particulates ranged from 20 to 1100 mg. Variations of time, temperature, and method of extraction effect total weights of organic extracts and concentrations. In the analysis of equal weights of air particulates enriches with pure benzo(a)pyrene, benz(c)acridine, and 7H-benz(de)anthracen-7-one the percentages of these compounds extracted ranged from 50 to 100, 15 to 100, and 50 to 80, respectively. On the basis of these data extraction efficiency studies are required for the proper selection of solvents used to define the organic extracts of airborne particulates. (Author's abstract)

06201

B. Y. Whitby, and B. Y. H. Liu

GENERATION OF COUNTABLE PULSES BY HIGH CONCENTRATIONS OF SUBCOUNTABLE SIZED PARTICLES IN THE SENSING VOLUME OF OPTICAL PARTICLE COUNTERS. (IN: EVALUATION OF OPTICAL PARTICLE COUNTERS-FINAL REPORT.) Minnesota Univ., Minneapolis. Particle Technology Lab. (Particle Laboratory Publ. No. 110.) 25p., June 1967.

It is shown by analysis and has been confirmed by experiment that large numbers of sub-countable particles in the sensing zone of single particle optical counters generate spurious counts in the counting range of the instrument. A statistical theory has been developed which is capable of predicting the size distribution and number of the spurious pulses from the concentration and particle size of the sub-countable aerosol. The theory has been extended to atmospheric aerosols obeying the distribution law dN/dDp = 0.91 phi 0/4 and it is shown that the many sub-countable particles present in atmospheric aerosols can account for the false counts often observed when single particle optical counters are used to size concentrated urban aerosols. It is also shown that the numerous sub-countable residue particles present in the atomized poly-styrene latex aerosols can generate spurious pulses in the lower channels, thereby affecting the accuracy of this calibration method.##

66/11

A. Goetz and O. Preining

THE AEROSOL SPECTROMETER AND ITS APPLICATION TO NUCLEAR CONDENSATION STUDIES. (National Academy of Sciences-National Research Council, Washington, DC)) Publ. 796, (1960) pp. 165-82.

The Aerosol Spectrometer (A.S.) separates quantitatively air-borne particles in the diameter range 1 microns to 0.01 micron from the atmosphere in the form of a size-spectrum, i.e. a continuous "sand-shaped deposit. The position of a particle thereon is indicative of its "Stokes' diameter" while it was air-borne, and independent of physical etc. changes incurred after its separation from the suspending air. This size classified separation results from the exposure of a laminar, continuous air flow to a large centrifugal field (up to 26,000 g), the flow rates vary between 1.1 and 7.6 lit/min. The size - (and mass-) distribution of the aerosol is derived from the topical variation of the deposit density along the spectrum. A brief description of the instruments and the mathematical basis of the analytical procedure is presented, as well as its application to a "model" aerosol of polystyrene latex. From the size definition in terms of the Stokes diameter a relationship between the locus of deposition of dry and hydrated hygroscopic nuclei is derived and subsequently supported experimentally for NaCl aerosols. The A.S. has been applied to the analysis of natural and artificial aerosols in the submicron range. The artificial generation and conditioning of NaCl aerosols and the so resulting size distribution is described. Traces of organic vapors during hydration and dehydration prevent or delay the equilibrium of the nucleus when the humidity of its gaseous environment is altered. (Author summary)##

66/06

B. Buscaglia and S. Wallach

FEASIBILITY STUDY OF A MULTIPURPOSE INFRARED PROPELLANT DETECTOR. (Patterson Moos Research Division, Lemmons

Corp., Jamaica, N.Y.) (ASD Technical Rept. No. 61-182.) (Aug. 1961). 22 pp.

This investigation was concerned with determining the feasibility of developing open-path narrow absorption infrared (NAIR) instrumentation capable of detecting and measuring very low atmospheric concentrations of various toxic propellant vapors. In the course of this program a novel measurement system was conceived, and a laboratory prototype of this system was designed and fabricated. Because of the unique spectral response characteristics of the NAIR detector, it was possible to combine in this one instrument the desirable features of both single and double beam instrumentation. The system was applicable to ethylene oxide, unsymmetrical dimethyl-hydrazine, dinitrogen tetroxide and hydrazine. Tests performed with this prototype instrument demonstrated system feasibility. The measurement sensitivity was, in all cases, within one order of magnitude of that required; in most cases it was substantially better than this. Sensitivity to ethylene oxide exceeded the specified requirements. In addition to demonstrating feasibility and determining sensitivity, these tests also indicated several simple modifications which would substantially reduce noise and thereby improve sensitivity. (Authors' abstract)GS

063011

MECHANISMS OF AIR POLLUTION REACTIONS. (Section VIII of Air Pollution Research Progress Report for Quarter Ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BR/69-BR/76.

The NOx-sensitized photooxidation of 2-methyl-1-butene was investigated. Yields with regard to the reaction production formaldehyde, methyl ethyl ketone, PAN, PPN, nitrates and CO were determined. The study of the NOx-sensitized photooxidation of tagged ethylene in the presence of other hydrocarbons was terminated. Results indicated that (a) the photochemical reactivity of ethylene in mixture with other hydrocarbons varies with change in the mixture composition, and (2) the reaction is unpredictable at the present time. (Author summary)GS

063201

J. D. Hawkes

ANALYSIS OF COMBUSTION PRODUCTS WITH GAS CHROMATOGRAPHY APPARATUS (A MASTER'S THESIS). (1963). 61 pp. (For the degree of Master of Science, Arizona Univ., Tucson.)
DDC: AD 410280

The purpose of this study was to develop techniques for applying principles of gas chromatography to the analysis of fuel gases and combustion products. By effective calibration of the gas chromatography apparatus, unknown samples of combustion products

and fuel gases were analysed both quantitatively and qualitatively. The procedure employed was to use known mixtures of pure gases and to record on an electronic recorder the response of the gas chromatography apparatus. Six different gases were used in the calibrating mixtures: H_2, O_2, N_2, CH_4, CO_2 and CO. Techniques, procedures and methods were established to identify the composition of unknown samples by the application and principles of gas chromatography. (Author abstract)##

06180

Dubois, L., A. Zdrojewski, C. Baker, and J. L. Monkman

SOME IMPROVEMENTS IN THE DETERMINATION OF BENZO(A)PYRENE IN AIR SAMPLES. J. Air Pollution Control Assoc., 17(12):818-821, Dec. 1967. 10 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

As benzo(a)pyrene (BaP) and benzo(k)fluoranthene (BK) both fluoresce strongly and it is possible to make accurate measurement of BaP in the presence of BKF in an unchromatographed air sample extract using fluorescence, this measuring technique served as the basis of the research discussed here. In this method benzene was first used as the extracting solvent, the columns being processed in a fume hood on account of its well known toxicity. As more experience was gained it was found that toluene could also be used with satisfactory results and benzene was abandoned as an eluting agent. Both benzene and toluene, with their aromatic structure, would be quite unsuitable eluting agents if subsequent measurements were to be made by ultraviolet absorption. Since in this method fluorescence is used, the aromatic structure is irrelevant. The essential condition is that the toluene used be free from fluorescing impurities. The method is simple and direct, and probably demands somewhat less skill and experience than older methods. It is worth mentioning that the calculations of the final values require an appreciable percentage of the total analytical time. The use of a programmed bench top computer reduces this calculation time for 20 samples from 5 hours to 5 minutes.##

06411

Singh, T., R. F. Sawyer, R. S. Starkman, and L. S. Caretto

RAPID CONTINUOUS DETERMINATION OF NITRIC OXIDE CONCENTRATION IN EXHAUST GASES. J. Air Pollution Control Assoc., 18(2):102-105, Feb. 1968. 8 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-151.)

A continuous sampling, continuous analysis method for measuring nitric oxide was demonstrated. Rapid oxidation of nitric oxide to nitrogen dioxide is obtained through ozonation. Nitrogen dioxide concentrations are determined by means of an ultra-violet absorption technique. Nitric oxide concentrations between 100 and 5000 ppm have been measured and response times of about 20 sec

obtained. The presence of unburned hydrocarbons in the exhaust sample has an adverse effect on the results of this technique which requires either the removal of hydrocarbons or adjustment of ozone concentration. (Authors' abstract, modified)**

06435

Smith, D. S., R. P. Sawyer, and E. S. Starkman

OXIDES OF NITROGEN FROM GAS TURBINES. J. Air Pollution Control Assoc., 18(1):30-35, Jan. 1968. 8 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.)

Experimental and theoretical studies were made to provide information on nitrogen oxide concentrations produced by gas turbine engines. Nitric oxide concentrations of from 100 to 350 ppm, adjusted to stoichiometric conditions, were measured in aircraft turbojet engines. Concentrations of less than 50 ppm, similarly adjusted, were measured in a 60 hp industrial gas turbine. Concentrations of about 100 ppm, also adjusted, were measured in a laboratory combustor of a design similar to gas turbine combustors. Carbon monoxide and unburned hydrocarbon concentrations also were determined. Comparison with predicted equilibrium concentrations shows strong departures from equilibrium. (Authors' abstract)**

06445

K. T. Whitby

RECENT AEROSOL RESEARCH - UNIVERSITY OF MINNESOTA. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-103.)

Polystyrene aerosols produced by an improved generator (described in study) have been studied with respect to the electrostatic charge on the polystyrene particles and the size distribution and charge on the residue aerosols resulting from the evaporation of the non polystyrene containing droplets. The median number of unit charges and standard deviation g of the charge distribution found on the plus and (-) particle is summarized. The FSI charges found are great enough to have a serious effect in many experimental applications. Diffusion and field charging studies of micron and submicron aerosols at pressure from atmospheric to 1 torr have been made. A new diffusion charging theory based on an improved kinetic model has been developed. The final equation which is identical in form to the White diffusion charging equation has been shown by experiment to be satisfactory for Knudsen numbers from 0 to 1 and by calculation to be satisfactory for larger Knudsen numbers. Work on an improved field charging theory for Knudsen numbers on the order of 1 is in progress. Considerable data has been obtained and an improved theory has been developed. A two stage electrostatic aerosol sampler of accurate sampling of micron and submicron size aerosols

onto any flat collecting surface of an area up to 50 sq. cm has been developed. The concentration and size distribution of particles from 0.001 to 3 microns in radius dispersed in the urban atmosphere was measured with a continuous-sampling sizing system composed of a nuclei counter, an electrical particle counter, and an optical counter. Atmospheric aerosol size distribution measurements made by previous investigators were reviewed and compared with the new information.##

06471

R. W. G. Wyeth and G. W. Tinsley

DETECTION AND MEASUREMENT OF INFLAMMABLE VAPOURS IN AIRCRAFT. Ministry of Aviation, Farnborough Hants, England, Royal Aircraft Establishment. (Rept. No. 65191.) (Sept. 1965). 74 pp.
DDC: AD477 232

A study is made of the feasibility of detecting and measuring concentrations of inflammable vapour within compartments of aircraft in flight. The basic requirements are outlined. A review is made of properties of inflammable vapours that might be exploited. Mention is made of some existing instruments and techniques, and their limitations for the present purpose are discussed. Especial emphasis is given to techniques of catalytic combustion and ionisation which with further development are thought likely to be suitable. (Author summary)

06508L

J. M. Deebe and R. L. Dorsey

A FLUORESCENT DYE TRACER AS A MEANS FOR DETERMINING PHYSICAL DECAY RATES OF AEROSOLS. Army Biological Warfare Labs., Fort Detrick, Frederic, Md. (Aug. 1958). 21 pp. (BWL Technical Memorandum 8-6.)

The use of fluorescein as a dye tracer for the determination of the physical decay rates of aerosols was investigated. Two types of chambers were used for most of the preliminary experimental: a 20-liter horizontal irradiation chamber, and a 1500 -liter, 6 foot diameter toroid which can be revolved at speeds of from 0.37 rpm on up, for periods up to 50 hrs or more. Small chamber clouds were generated by a Vaponefrin Nebulizer. Clouds in the toroid were generated by a modified DeVi atomizer. The spray medium in all cases was beef heart infusion. Two methods of sampling were employed. The small chamber samples were collected on Millipore Filters. Samples from the toroid were collected in standard 2.5 l/min impingers, containing 10 ml of glass-distilled water. Fluorometric analyses of the above dye solutions were made with a Light Scattering Microphotometer. A standard curve, showing the relationship between a known dye concentration and photomultiplier reading, was established with the particular dye lot to be used. A separate curve must be developed for each dye, or dye lot, and/or for each solvent in which samples are to be collected, since some impinger fluids contain materials that will

fluorescence. Whenever possible samples were collected in glass-distilled water, or on MF filters and then dissolved out established for a particular dye lot and solvent it was but a matter of a few minutes to determine the dye content of a series of samples. The method is simple and can be performed rapidly with a high degree of precision, sensitivity and reproducibility.##

06629

R. A. Saunders

ANALYSIS OF THE SPACECRAFT ATMOSPHERE. Naval Research Lab., Washington, D. C., Chemistry Div. (NRL Rept. No. 5816.) (Oct. 31, 1962). 21 pp.
DDC: AD 288 255

A study has been made of the nature of the contaminants introduced into the cabin atmosphere of a Project Mercury space capsule, external to the pressure suit, by the deliberately induced malfunction and overheating of certain parts of the capsule equipment during simulated flight. The contaminants were collected and concentrated by an adsorption-desorption cycle employing activated charcoal as the adsorbing medium. An analytical gas chromatograph was used to resolve the components of the contaminant mixture, which were then recovered individually from the effluent stream of the chromatograph and identified by means of their infrared spectra. Thirty-five components were detected in this atmosphere, 26 of which were identified. Approximate minimum concentrations have been indicated for the latter. The contaminant mixture comprised aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, and aliphatic alcohols, esters, and ketones. Some of the contaminants were present in sufficient concentration that they could possibly reduce the effectiveness or efficiency of an exposed pilot. (Author abstract)##

06630

R. Mettig

ESSAY ON THE PROBLEMATICS CONCERNING THE DETERMINATION OF HYDROCARBONS IN ATMOSPHERIC AIR. Staub-Reinhalt. Luft 27 (2), 181-6 (1967).

A proposal of method of hydrocarbon determination, which takes into consideration the problems of interpretation, is discussed. The majority of toxic substances in atmospheric air is present in the same form in which they take effect in vivo. The degree of concentration of a given, injurious substance, is in most cases a measure for the endangerment of the health of human beings. Quite different, however, is the cancerogenic effect of polycyclic hydrocarbons in the air. The conclusions drawn from the atmospheric content of cancerogenic hydrocarbons with regard to the endangerment of health of human beings depends solely in the assumption, that the total content of hydrocarbons stands in correlation with the active hydrocarbons. Owing to the diversities of the possibilities which govern the formation of "active" hydrocarbons, such a correlation is naturally very questionable. A better approximation may be attained by using a

method consisting of the following steps in succession: The splitting-up of an aspirated sample of dust into its components according to the diameter of the separate particles; The portional extraction of the particles having a diameter of 100 to 5000 micrograms with a simulated body-liquor for a period of time corresponding to the time of retention of the dust particles in the human lung; and Review of the cancerogenic activity of the extract. The usual determination of the content of hydrocarbons in atmospheric air cannot be replaced but merely supplemented by procedures for the determination of their active components, as the knowledge of the total amount of the various hydrocarbons permits conclusions to be drawn with regard to their origin, this being of great importance for the removal or abatement of emissions.##

06661

E. G. Rachmar

DETERMINATION OF BENZENE TOLUENE AND XYLENE SIMULTANEOUSLY PRESENT IN THE AIR . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 141-7, 1962. (Gigiena i Sanit.) 250 (5) 58-62, 1960. Translated from Russian.
CFSTI; 62-11103

The new methods in this presentation were based on the formation of azo-compounds. Benzene was nitrified with a 10% nitration mixture to the dinitro form, which was then reduced with metallic zinc, dissolved in the presence of concentrated hydrochloric acid by a 1% solution of sodium nitrate, and combined with m-phenylenediamine. The resulting azo-compound is of a yellow-brown color. The sensitivity of this reaction is 0.005 mg in the volume used for colorimetry. A series of experiments were performed with known amounts of benzene determined on a parallel basis by the azo-compound formation and the Vanovskii reactions. Control tests showed that the presence of an equal amount of toluene and of an equivalent 60% amount of xylene, did not interfere with the determination. The toluene determination method consisted in the reduction of trinitrotoluene and the combination of the reduced products with diazotized sulfanilic acid. The sensitivity of the reaction was 0.01 mg of toluene in the colorimetric volume. Additional control tests showed that the presence of an equal concentration of xylene and of half the equivalent volume of benzene did not interfere with the determination. No suitable basis found for the development of a method for xylene determination in the presence of toluene; for this reason xylene was separated from benzene and toluene. The following studies were made; 1) conditions of benzene, toluene and xylene absorption on silicagel; 2) conditions of desorption such as effects of temperature and air volume passed through the silicagel in order to displace the benzene, toluene and xylene. On the basis of results obtained conditions for the separation of xylene from benzene and toluene are recommended.##

06662

P. P. Dikun

QUANTITATIVE DETERMINATION OF LOW 3, 4-BENZPYRENE CONCENTRATIONS WITH FINE STRUCTURE FLUORESCENT SPECTRUM . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 153-69, 1962. (Vopr. Onkol.) 7, (7) 42-51, 1961. Translated from Russian. CFSTI: 62-11103

A new method is described for the determination of lower 3, 4-benzpyrene concentration than with any previous tests. This method combines the principle of spectrofluorometry with the fine structure spectral fluorescence phenomenon described by E. V. Shpol'skii. Quantitative determination is based on ratio between 3,4-benzpyrene and 1,12-benzoperilene absorption intensity lines. By the fine structure spectral fluorescent method, determinations can be made of 0.05 - 0.10 gamma or less of 3, 4-benzpyrene per sample with a high degree of accuracy. Average deviation of 15 control tests was only ± or - 8%. Deviations exceeding 10% occurred in 3 of the 15 control tests, and none ex-

06663

B. W. Sundermann, J. E. Howes, and H. S. Tasaneberg

THE DEVELOPMENT OF AN IMPROVED METHOD OF SAMPLING AND ANALYSIS FOR ATMOSPHERIC IODINE . (Battelle Memorial Inst., Columbus, Ohio.) (July 22, 1963). 20 pp. (Rept. No. BMI-X-10137.)

The feasibility was studied of an iodine sampler which will be somewhat analogous to a gas-liquid chromatographic column although the separation of the iodine species will not employ the chromatographic principle. The system will consist of a column of sodium bisulfite particles or sodium bisulfite on a solid matrix such as Chromosorb, coated with a viscous organic solvent. A glass-fiber filter will precede the column to remove particulate iodine from the sample stream. In operation, the elemental iodine and organic iodine compound will be absorbed and retained by dissolution in the organic film on the particles. The elemental iodine will diffuse to the interface between the liquid and solid phase, react with the solid phase to form the iodide, and thus be separated from the organic iodide. Gaseous inorganic iodine compounds are expected to be absorbed on the surface of the organic film or pass through the column unaffected. Following the sampling period, water would be passed through the column to elute any water soluble iodine compounds, organic iodides would be recovered by dissolution of the organic phase with a solvent, and the sodium bisulfite particles would be recovered to obtain the reacted, elemental iodine. Reaction studies between the various forms of iodine, dodecane, and Hansil indicate that the proposed iodine sampling technique is feasible. Elemental iodine and methyl iodide will dissolve in the stationary liquid phase. Methyl iodide will remain in stationary liquid, while the elemental iodine will be reduced to the iodide by solid Hansil, the solid support material. The experiments show that both at 24 C and 100 C the extraction efficiencies for elemental iodine are better than 99 per cent after 15 minutes contact times. The

extraction of iodine in the solid NaHSO3 should occur rapidly, therefore, reaction with the organic phase will not be significant. The experiments also show that no apparent reactions occur between the methyl iodide and the reducing phase. When iodine was extracted from a mixture of methyl iodide, iodine, and dodecane, isotopic exchange occurred between the iodine and methyl iodide. When NaI and HI solutions were contacted with dodecane, I- in solution did not react with dodecane.##

06699

C. F. Ellis, R. F. Kendall, and R. H. Eccleston

IDENTIFICATION OF SOME OXYGENATES IN AUTOMOBILE EXHAUSTS BY COMBINED GAS LIQUID CHROMATOGRAPHY AND INFRARED TECHNIQUES. Anal. Chem. 37 (5) 511-6 (Apr. 1965).

A method for identifying certain oxygenates in automobile exhausts by gas liquid chromatography with confirmation by infrared spectra is described. The oxygenates were separated from exhaust gases by scrubbing with a 1% solution of NaHSO3. Then, oxygenates which eluted ahead of water were separated from the solution in a preparatory column. The carbonyls indicated in the chromatograms were derived from the thermal decomposition of the bisulfite complexes of these compounds in the chromatographic column. The eluted oxygenates were collected in a cold trapping needle and charged to an analytical GLC unit employing thermal conductivity detection. A chromatogram was thus obtained, and the individual components indicated in the sample were collected in separate plastic bags and transferred to a 10-meter infrared cell for confirmation of the GLC identifications. Acetaldehyde, propionaldehyde, isobutyraldehyde, n-butyraldehyde, acetone, methyl ethyl ketone, methanol, and ethanol were present. Acrolein cannot be detected by this method. After identification of the oxygenates present, GLC analyses employing flame detection were made directly upon the scrubber solutions and also on preparatory column effluents.##

06702

Pagnotto, L. D. and L. F. Lieberman

URINARY HIPPURIC ACID EXCRETION AS AN INDEX OF TOLUENE EXPOSURE. Am. Ind. Hyg. Assoc. J., 28(2):129-134, March-April 1967. 20 refs. (Presented at the 27th Annual Meeting, American Industrial Hygiene Assoc., Pittsburgh, Pa., May 1966.)

A simple procedure is described for the analysis of hippuric acid in urine. The sample is extracted with an isopropyl alcohol-diethyl ether mixture, and the hippuric acid is measured in the extractant by ultraviolet spectrophotometry. The excretion of hippuric acid in urine as a metabolic product of toluene was studied in relation to its usefulness in industrial exposures to toluene. Good correlation of hippuric acid content of end-of-shift samples and toluene exposure was found in studies performed in leather-finishing and rubber-coating plants. The

hippuric acid test was also found to be useful in measuring the adequacy of cartridge-type respirators in tank painting work. Air-urine correlation, although not complete, suggests that exposures to 200 ppm (MAC) of toluene would produce a urinary hippuric acid content of about 7.0 gm/liter or 5.0 gm/gm of creatinine in samples collected at the end of the work shift.##

06858

A. Richardson, J. Robinson, R. Rush, and J. R. Davies

DETERMINATION OF DIELDRIN (HEOD) IN BLOOD. Arch. Environ. Health 14 (5), 703-8 (May 1967).

Two methods for the determination of HEOD (1,2,3,4,10,10, hexachloro-6, 7 epoxy-1,4,4a,5,6,7,8,8a-octahydro-1, 4 endo, exo-5, 8-dimethanonaphthalene (dieldrin) in blood were assessed. The procedure using acetone as an extraction solvent gives reproducible results and is rapid. The precision of the extraction procedure, as reassured by the coefficient of variation, is of the order of 6%. The accuracy, assessed by comparison with the destructive hydrolysis technique, does not appear to differ significantly from 100%. Evidence has been obtained that the concentration of HEOD in the blood of the same person can vary in random manner from time to time, and the coefficient of variation for samples of blood collected at different times from the same person is about 25%. The acetone extraction procedure is nondestructive and should therefore be applicable to the determination of the organochlorine insecticides, particularly those which are unstable to alkalies and their metabolites.##

06876

N. N. Lagoshnaya and N. A. Shuravleva

DETERMINATION OF FREON-22 IN AIR. (Kolichestvennoe opredelenie freona-22 v vozdukhe.) Hyg. Sanit. (Gigiena i Sanit.) 30 (6), 366-71 (June 1965). Russ. (Pt.)

The colorimetric and manometric methods for the determination of Freon-22 in the air were described. The colorimetric method is applicable for freon-22 concentrations in the air ranging from 0.5 to 0.000005% and the analytical time is approximately five minutes. The manometric method makes possible the determination of freon-22 in the air for concentrations ranging from 0.5 to 15 vol. % and the analytical time is 10 to 15 minutes.##

06891

Belyakov, A. A., and V. G. Smirnova

DETERMINATION OF FURFUROL IN THE AIR. ((Opredelenie furfurola v

vozdukha.)) Gig. Sanit. (Fiziena i Sanit.) 30(1):390-391, Mar. 1965. Translated from Russian.
CFSTI: TT 66-51033

Methods based on color reaction with aniline have been proposed for determining furfurol vapors in the air of industrial premises. The reaction results in the formation of dianilide of oxyglutaconic aldehyde, belonging to the class of polymethine dyes. A common defect of these methods is the instability of dyed solutions, which is reflected in the reproducibility of the results. Using the above-mentioned reaction, the authors were able to find the conditions for a more reliable determination of furfurol in the air. They used 98% of icy acetic acid as the absorbent solution and solvent. An aniline concentration within the limits of 50-70 mg per ml of acetic acid is preferable. In this case the dying of the solutions reaches the maximum in 15 minutes and is preserved unchanged for the next 45 minutes. Furfurol vapors are well absorbed by acetic acid. To determine, for instance, the maximum permissible concentration of furfurol (0.01 mg/l), it suffices to pass not more than 25 ml of air through an absorbing instrument with 2 ml of acetic acid. The air humidity is apparently little detained by the icy acetic acid. Thus, the sucking of up to 10 l of air through the absorbing instrument with 2 ml of acetic acid containing 0.5-5 ug of furfurol is not reflected in the results of the determination.##

66094

Nasunov, V. A., and T. R. Aidarov

A FAST METHOD FOR DETERMINING LEAD IN THE AIR. ((Uskorennyi metod opredeleniya svintsa v vozdukhe.)) Gig. Sanit. (Gigiena i Sanit.), 30(3):392-396, Mar. 1965. Translated from Russian.
CFSTI: 66-51033

In a number of cases there is a need for rapid and accurate determination of the lead aerosol content in the air. The usual chemical and physicochemical methods applied for this purpose are rather lengthy and labor-consuming. The most advantageous is color reaction on paper without any previous working of the ground. The fullest response to all requirements is afforded by the color reaction with tetrahydroxy-p-benzoquinone. Here a legible scale is obtained for microgram parts of lead on paper, the pink coloring lasts for up to six months, and the reagent solution itself is stable for up to 4 months. Antimony, bismuth, zinc, copper, iron, arsenic, chromium and calcium, also cadmium (in equal concentrations with lead) do not interfere with determination. The air sample was taken out with an aspirator plant at a rate of 1 l/min onto filter paper (blue band). When the lead content is within the normal limits, 10-15 l of air have to be taken. A disk of paper 17 mm in diameter was placed in a plexiglas holder of the proper dimensions, and a drop (0.05 ml) of reagent was applied to the filter in the holder; after it had dried, samples were taken, and then a drop (0.05 ml) of buffer solution was applied. The pink coloring appeared at once. Then the filter was taken out of the holder and was placed on clean filter paper (with the coloring upward) to dry. After a few seconds, the coloring was compared with the scale on the paper obtained by the analogous method for certain lead concentrations. The sensitivity of the

method was 0.015 mg in the drop (0.05 ml). For more reliable results, it is better to make two parallel (in the worst case, successive) determinations. The duration of one determination is not more than seven minutes, if the air contains lead in more than the normal amount.##

06902

B. V. Gorshaya

A NEW PHOTOCOLORIMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE IN AIR. (Novyi fotokolorimetricheskii metod opredeleniya naftalina v vozdukhe.) Gig. Sanit. (Gigiena i Sanit.) 30 (11), 341-4 (Nov. 1965) Russ. (Fr.)

A photocolorimetric method for routine analysis of naphthalene is described. The method was tested under industrial conditions by determining the naphthalene in the air of the naphthalene shop of the Nutchenkovskii coke-chemical plant. Interference by phenols was prevented by trapping them first in an absorber containing 0.1 N alkali which was placed in front of the absorber for the naphthalene. The determination was carried out by two methods, with a nitrating mixture and with alizarin. There was good agreement between the results.##

06903

I. A. Pinigina

THE SEPARATION AND DETERMINATION OF ALIPHATIC ALCOHOLS IN AIR BY PAPER CHROMATOGRAPHY. (Razdelenie i kolichestvennoe opredelenie alifaticheskikh spirtov v vozdukhe s pomoshch'yu khromatografii na bumage.) Gig. Sanit. (Gigiena i Sanit.) 30 (11), 344-9 (Nov. 1965). Russ. (Fr.)

Separate determination of aliphatic alcohols (C1-C10) that simultaneously pollute the air in factories manufacturing synthetic alcohols was accomplished by paper chromatography. Volatile compounds can be determined by paper chromatography after their conversion to nonvolatile compounds. The alcohols are converted to the benzoates. The derivatives of alcohols C1-C6 arranged themselves on the chromatogram in the order of increasing number of carbon atoms. The derivatives of alcohols C7-C10 arranged themselves on the chromatogram in the descending order of the number of their carbon atoms. The alcohols can be quantitatively determined by chromatographic separation, by means of the intensity of the color of the spots formed by their eluates. In the case of alcohols C1-C6, the color is eluted and the optical density of the elute measured with an SF-4 spectrophotometer or a photocolorimeter. Quantitative determination of the alcohols C7-C10 was performed visually by comparing the color intensities of the sample spots with those of reference spots made with standard solutions.##

06955

H. H. Inscoe

PHOTOCHEMICAL CHANGES IN THIN LAYER CHROMATOGRAMS OF POLYCYCLIC, AROMATIC HYDROCARBONS. Anal. Chem. 36, 2505-6 (Dec. 1964).

The change in spot color due to photochemical changes of thin layer chromatograms in the identification of polycyclic aromatic hydrocarbons was discussed. The changes were observed on spots of 15 representative hydrocarbons following exposure to ultraviolet light. The absorbents used were silica gel G, aluminum oxide G, cellulose powder, and acetylated cellulose (21%). After the initial exposure to ultraviolet light, the changes take place even when the plates are kept in the dark. Similar, but slower, changes also occur on plates kept in ordinary moonlight, without exposure to other ultraviolet illumination. The changes are accelerated by continuous irradiation, either by long-wavelength ultraviolet light or by light of 253.7 millimicron. The nature of the developing solvent appears to have little effect on the colors observed. The presence of solvent often accelerates the changes in the spots. This effect is particularly noticeable with chlorinated solvents.##

07061

H. E. Whitman and A. E. Johnston

SAMPLING AND ANALYSIS OF AROMATIC HYDROCARBON VAPORS IN AIR: A GAS-LIQUID CHROMATOGRAPHIC METHOD. Am. Ind. Hyg. Assoc. J. 25 (5), 464-9 (Oct. 1964).

The sampling and analysis of air for mixtures of benzene, toluene and xylene vapors are described. The application of a molecular sieve prefilter to remove water vapor and a silica gel adsorption tube for the collection of the hydrocarbon was investigated. The development of a method for the extraction of aromatic hydrocarbons from silica gel and their subsequent estimation by gas chromatography is reported. The method is sufficiently sensitive to permit accurate measurement at 10% of the MAC level. (Authors' abstract)##

07097

L. H. Piette, J. H. Sharp, T. Kuwana, and J. N. Pitts, Jr.

PARAMAGNETIC RESONANCE OF SOME BENZOPHENONE DERIVATIVES IN THEIR PHOSPHORESCENT STATE. J. Chem. Phys., 36(11), 3094-5 (June 1, 1962).

Paramagnetic resonance absorption of the triplet or phosphorescent state in several para-substituted derivatives of benzophenone was observed. The phosphorescent states are formed during uv irradiation of the compounds in rigid solutions at liquid-nitrogen temperatures. Solutions of 4-aminobenzophenone,

4-diethylaminobenzophenone, 4,4'-bis-(diethylamino)benzophenone, and 4-phenylbenzophenone were irradiated at 77 deg K. Paramagnetic resonance absorption was observed for all the above compounds at a magnetic field of about 1500 gauss, (g equals 4). In addition to paramagnetic resonance absorption at g equals 4, the irradiated solid solutions show strong phosphorescence. This phosphorescence decays exponentially with a mean lifetime of 0.41 plus or minus 0.09 sec and agrees favorably with the decay of the paramagnetic resonance absorption signal when the light is cut off. Mean phosphorescent lifetimes of the other compounds range from 0.2 to 0.5 sec and are being correlated with the decay of their EPR signals at g equals 4.##

07109

McEwen, W. J.

IMPROVED SAMPLING VALVE FOR GAS CHROMATOGRAPHY. J. Chromatog., Vol. 9, p. 366-369, Oct. 1962.

For the gas chromatographic analysis of engine exhaust and air for trace amounts of hydrocarbons, a gas sampling valve with the following features was required: (1) no detectable gas leaks, (2) no contamination or adsorption of the sample, (3) fast switching speed for instantaneous sample injection, (4) interchangeable sample volumes with the smallest about 0.1 ml, and (5) good sampling precision. A four-way solenoid valve for use with industrial gas chromatographs leaked seriously, but otherwise showed promise of meeting the above requirements. A method for making the valve gastight and an example of the use of the valve in the analysis of highly diluted hydrocarbon mixtures are discussed. In the disassembled valve the stainless steel part is separated from the brass base by a Teflon diaphragm, which opens and closes the valve ports by means of air pressure. The surfaces separated by the diaphragm bore the marks (mainly long scratches) of the grinding operation in the manufacture of the valve. It was found that the valve could be made gastight with Teflon diaphragms by polishing both surfaces to a mirror-like finish. The smallest sample that has been measured with the valve is 80 ul. The precision of the valve has not been extensively investigated; however, the average deviation of peak heights for repeat analyses of dilute hydrocarbon mixtures is usually better than plus or minus 0.5%.##

07106

Orenberg, B. Sh.

DETERMINATION OF VINYL CHLORIDE IN THE AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:149-150, Jan. 1960. (Also published in Gigiena i Sanit., No. 11:43-44, 1954.) Translated from Russian.
(PHS: PB 60-21089

The procedure described is based on bromination in chloroform solution with a bromine solution in a 1:1 mixture of glacial acetic

acid and chloroform. The method is sensitive to 0.10 mg of vinyl chloride per test. The absorption of vinyl chloride from air is accomplished by aspirating the tested air through chloroform kept at -10 to -15 deg.; at the rate of 10 - 12 liters per hour. This method is specific in the presence of methanol and dichloromethane. Observing the additional steps and precautions indicated obviates the interference of ethylene and of chlorine.##

07150

Dendrichsh, V. P. and A. V. Demidov

APPARATUS FOR THE DETERMINATION OF CARBON MONOXIDE AND CARBON DIOXIDE IN THE AIR AND OF GASEOUS COMPONENTS OF LIQUID FUEL. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:168-177, Jan. 1960. (Also published in Lab. Delo 3(5):46-51, 1957.) Translated from Russian.
OTSTI: TT 60-31049

The principle of the method described is the same as of the combustion methods currently in use. The carbon monoxide or the hydrocarbons contained in the air are oxidized to carbon dioxide in a combustion chamber with the aid of an electrically heated coil. The carbon dioxide is then passed through a coil condenser (absorber) which contains a known volume of a known solution of barium hydroxide, and the excess of the latter determined by titration with a standardized solution of HCl, and the results expressed in mg of CO or of hydrocarbons, as the case may be, per liter of air. The apparatus consists of four main sections: the purifying section, the distributor, the combustion chamber and the absorber. The apparatus and technic are described in detail.##

07151

Bronshberg, F. Sh.

CHROMATOGRAPHIC SEPARATION OF BENZENE AND ISOPROPYLBENZENE AND OF BENZENE AND CHLOROBENZYL IN AIR ANALYSIS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:187-191, Jan. 1960. (Also published in Gigiena i Sanit., 23(1):77-81, 1958.) Translated from Russian.

The method studied consisted of a combination of thermal desorption and chromatographic analysis. Sets of conditions developed for the chromatographic partitioning of vapors of benzene, isopropylbenzene and chlorobenzyl present in the air of industrial manufacturing premises. The partitioning was accomplished at the time of the sample taking when the air was aspirated through the system which consisted of a Y-shaped tube containing grade ASK silicagel and of two absorbers containing 2 ml of a nitro-mixture. The benzene is absorbed by the nitro-mixture, the second component remaining adsorbed by the silicagel. Colorimetric methods are described for the determination of the isopropylbenzene and the chlorobenzyl in the presence of benzene.##

07156

Sender:khina, D. P.

DETERMINATION OF PARAFFIN AND CERESIN AEROSOLS IN THE AIR OF INDUSTRIAL PLANTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. I:206-207, Jan. 1960. (Also published in Gigiena i Sanit., 23(8):77-78, 1958.) Translated from Russian
CFSTI: TT 60-21069

For quantitative determination of petroleum paraffin vapor its differential characteristics of dissolving readily in ether and with difficulty in ethanol were utilized. The ethanol is added to the ether-dissolved petroleum paraffin and cooled to 0 deg which causes the paraffin to separate from solution as an emulsion whose turbidity varies directly with the quantity of the dissolved paraffin. The standard solution to be used in the turbimetric comparator is prepared from a weighed amount of petroleum paraffins in ethyl ether, usually 1 mg per ml. Quantitative analysis of synthetic ceresin is done gravimetrically by aspirating through a glass filter No. 2 at the rate of 0.2 lit./min. using ether as the absorber. The absorbed ceresin is removed from the glass filter plate by dissolving it in hot gasoline; the latter is driven off by evaporation in a preweighed porcelain dish over a waterbath. After the gasoline has been evaporated the dish is cooled for 20 - 30 minutes in a desiccator and weighed on an analytical balance.##

07285

Khrustaleva, V. A.

DIFFERENTIAL DETERMINATION OF ORGANIC AND INORGANIC LEAD IN THE AIR OF GARAGES. Text in Russian. Gigiena i Sanit. No. 9:48-49, 1959. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 8-10, March 1960.
CFSTI TT60-21188

Air samples for the determination of inorganic compounds should be collected by aspirating 300 - 500 li of air through absorbent cotton at a rate of 10 li/min. With reference to tetraethyl lead it may be stated that, owing to the presence of carbon monoxide and vapors of hydrocarbons in the air, and the nonspecificity of the method, its determination in the form of intact molecules is not feasible. It is necessary first to destroy the molecules and to proceed with the determination of free lead. For this purpose tetraethyl lead is absorbed from the air into alcohol at a rate not exceeding 1 li/min, i.e., 60 li per hour; at a higher rate evaporation of the alcohol-dissolved tetraethyl lead will take place. By the method used in this study metallic lead determinations could be made reliably with 0.002 - 0.005 mg as the lower limit. For the collection of tetraethyl lead air samples the use of conventional equipment is proposed, such as a suction dust collector, a high velocity flowmeter, corrugated tubes as adapters for cotton filters to retain metallic lead, and Petri

tubes containing 10 ml of alcohol for the absorption of the tetraethyl lead. By the proposed method of air sampling it was possible to aspirate within one hour and a half up to 1 cu. m. of air and to accumulate a quantity of tetraethyl lead sufficient for a precise determination.##

07298

Dikun, P. P.

THE DETERMINATION OF 3,4-BENZPYRENE IN PRODUCTS OCCURRING IN THE MANUFACTURE OF SYNTHETIC LIQUID FUEL. Text in Russian. Vopr. Onkol.; Vol. 4, p. 289-291, 1958. 4 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 122-125, March 1960.
CFSTI TT60-21168

The results of fluorescent-spectral analyses of a series of the primary, intermediate, and final products in the U.S.S.R. manufacture of synthetic liquid fuels by the hydrogenation method are presented. The analytical procedure was as follows: One gram of the test material was dissolved in 15 - 20 ml of petrolic ether. Highly viscous products, such as coal paste, petroleum residue, etc., not easily soluble in petrolic ether were first dissolved in 2 - 3 ml of benzene, and then diluted with a specified volume of petrolic ether, which was accompanied by the formation of a heavy precipitate, the latter was removed with the aid of a Buchner funnel filter. The filtrate was passed through a column of aluminum oxide; the absorbed substances were eluted with a mixture of petrolic ether and benzene. The passing of the substances through the column was followed with the aid of a luminescent light. The fluorescent spectra of the chromatographically partitioned fractions were photographed for permanent recording of the presence of carcinogenic substances. From the concentration of 3,4-benzpyrene found in the partitioned fraction the total content of 3,4-benzpyrene in the product was calculated. The method employed was designed for the detection of 3,4-benzpyrene as the representative carcinogenic factor of polynuclear aromatic hydrocarbons. Results of investigations by this method fully agree with theoretical assumptions that 3,4-benzpyrene and probably the other carcinogenic substances of this type were not newly formed during the production of synthetic liquid fuel, but were destroyed, if originally contained in the primary material. It must be borne in mind that these conclusions apply only to the 3,4-benzpyrene types of carcinogenic substances; the results of this investigation do not exclude the possibility of the formation of carcinogenic substances of different chemical structures.##

07339

H. Tanigura

AN APPLICATION OF GAS CHROMATOGRAPHY TO THE ANALYSIS OF SOLVENT VAPOURS IN THE INDUSTRIAL AIR. REPT. 1. Text in Japanese. Japan J. Ind. Health (Tokyo), 7(9):7-10, Sept. 1965. 7 refs.

The determination of solvent vapours by means of gas chromatography is discussed. Industrial air is sampled and a survey is made on the method of quantitative determination of aromatic hydrocarbons and others in the solvent. The best result is obtained with gas chromatography under the following conditions. Stationary phase: 3% squalane/diasolid M (60-80 mesh) 3 m packed column. Column temperature: 80 degrees C-100 degrees C. Sample inlet temperature: 80 degrees C-100 degrees C. Sample inlet temperature: 80 degrees C-100 degrees C. Carrier gas: Nitrogen. Gas flow rate: 20-30 ml/min. Detector: Hydrogen flame ionization detector. After performing gas chromatography with gas, the detector response peak is measured. An then the concentration of the sampled gas is determined by reading the value of the response peak against the standard calibration curve of its equivalent gas.##

07373

Hettche, G. and H. Von Becker

METHOD FOR THE GRAVIMETRIC TRACE ANALYSIS OF HYDROCARBON VAPORS. ((Verfahren zur gravimetrischen Spurenanalyse der Dämpfe von Kohlenwasserstoffen.)) Text in German. Stadthygiene (Duisen/Hamburg), 16(3):65-68, Mar. 1965. 10 refs.

A survey of maximum allowable concentrations for various hydrocarbons suggests that it is desirable to develop a simple non-selective analytical method to determine quantitatively hydrocarbons down to concentrations of the order of magnitude of 1 ppm. The method described in detail is based on the adsorption of hydrocarbons on activated carbon. A 500-liter plastic sack is used to sample the air. The fabrication of the sack is described. With a membrane pump the gas is taken from the bag, metered, and passed through two drying bottles filled with sulfuric acid. For aromatic compounds, the sulfuric acid must be replaced by $CaCl_2$, P_2O_5 or $Mg(ClO_4)_2$. Then the gas passes through two U-shaped tubes with activated carbon. The tubes are weighed before and after the air passage. Weight differences of the second tube are used to correct the weighing of the first tube. The method was tested with n-hexane, benzene, carbon tetrachloride, ethyl acetate, trichloroethylene, diethyl ether, chloroform, tetrachloroethane, and butane. On the average, about 65% of the theoretical amount could be detected. Butane and carbon disulfide give large errors. Results from tests performed in the laboratory and in an underground garage are presented in four tables. Typical concentrations of the test substances were 10 to 70 mg/cu. m.

07375

S. Noriguchi, S. Shinagawa, T. Utsunomiya, S. Iyoda, M. Tanaka

ATMOSPHERIC DETERMINATIONS OF CHLORINATED HYDROCARBONS, ESPECIALLY THE DETERMINATION OF 1,1,1-TRICHLOROETHANE. Text in Japanese. Japan J. Ind. Health (Tokyo), 7(5):25-28, May 1965. 5 refs.

The determination of chlorinated hydrocarbons in air, particularly that of 1,1,1-trichloroethane in air was examined. Vapor of 1,1,1-trichloroethane is collected by adsorption on silica gel in U-tubes. Extraction of the vapor from silica gel is made by isopropyl alcohol at 52 C, followed by filtration. Hydrolysis of the filtrate is made at 52 C by dissolving some pellets of potassium hydroxide. The solution is then neutralized with 5N acetic acid and 1 ml of 5% potassium chromate is added as an indicator, determination is made for hydrolyzed chlorine ion by titration with 0.1N silver nitrate.##

07386

H. Kanazu

DETERMINATION OF ORGANIC SOLVENT VAPOR-AIR MIXTURES BY A NON-DISPERSIVE ULTRAVIOLET GAS ANALYSER AND EXAMINATION OF PRECISION. Text in Japanese. Tokyo Kogyo Shikensho Hokoku (Rept. Govt. Chem. Ind. Res. Inst. Tokyo) (Tokyo), 62(7): 257-265, July 1967. 11 refs.

A convenient and rapid procedure for determining the organic solvent vapors in air has been studied which permits determination by direct ultraviolet photometric absorbance measurements. The higher boiling point samples were vaporized in a newly designed, electrically heated evaporator. The organic solvent vapor can then be admitted to the sample gas cell until its pressure equals atmospheric pressure. Precision and accuracy of the determination by the analyzer were examined statistically. Toluene ethylbenzene, chlorobenzene, aniline, cyclohexanone, pyridine, nitromethane, nitroethane, tetrachloroethylene, and furfuryl alcohol were detected in the following minimum concentrations: 5, 3, 13, 1, 65, 55, 57, 1 and 1 ppm, respectively. There was a linear relationship between the absorbance and the concentration in the chlorobenzene, aniline, cyclohexanone, pyridine, nitromethane, and nitroethane. Maximum allowable concentration value (75 ppm) of chlorobenzene can be determined, whereby a 95% confidence interval extends from 60 ppm to 90 ppm. Considerably less than the maximum allowable concentration of many organic solvents can be detected by the analyzer. (Author's summary, modified)##

07400

Shabad, L. M.

STUDIES IN THE U.S.S.R. ON THE DISTRIBUTION, CIRCULATION AND FATE OF CARCINOGENIC HYDROCARBONS IN THE HUMAN ENVIRONMENT AND THE ROLE OF THEIR DEPOSITION IN TISSUES IN CARCINOGENESIS: A REVIEW. Cancer Res. 27(6):1119-1137, June 1967. 80 refs. (Presented in part at the 9th Int. Cancer Congr., Tokyo, Japan, Oct. 1966.)

By the use of quantitative spectrofluorescent assay of such carcinogenic hydrocarbons as benzo(a)pyrene (BP), it is possible to follow the carcinogenic hydrocarbons at different stages of their distribution and circulation in animal organisms and in human environment. The carcinogens circulate from one product to

another, and from industrial and transport exhausts into the air. The exhausts from factories, heating systems, and combustion engines fall on soil, appear in water, accumulate or disappear, pass from nutrient medium into microorganisms, and contaminate fodder and even human food. The action of some soil bacteria in transforming and destroying BP not only throws light on the fate of this material in the soil, but indicates the possibility of biological purification of the human environment from carcinogenic hydrocarbons. Modern accurate methods of hydrocarbon determination (for BP the limit is 0.000001 mg/ml) show new ways to cancer prevention.##

07403

Gyrevska, F.; S. Martyniak, and B Gloviak

INTERFEROMETRIC MEASUREMENT METHODS OF AIR POLLUTION. (Interferometryczna Metoda Oznaczania Zanieczyszczen.) Text in Polish. Ochrona Pracy (Warsaw), 22(2):16-19, Feb. 1967. 4 refs.

Experiments confirming the suitability of the interferometric method for analysing all known and unknown gaseous substances of atmospheric air were made. The basis of the method is the refraction of light by gases measured in an interferometer. This consists of two enclosed parallel tubes with the following arrangement: monochromatic light source, slit, collimator, lens, diaphragm, cuvette, movable compensator, telescopic lens arrangement for observing the field of view, and a rotating drum for manual adjustment of the compensator. By this method, a wide range of concentrations of all chemical substances can be measured in several seconds. A schematic of the instrument, a discussion of the calculations, and a report of an experiment to determine the cyclohexane concentration in air are given. At present, the method is still limited to the analysis of binary mixtures.##

07427

G. E. Moore, R. G. Thomas, J. L. Hoshaw

THE ROUTINE DETERMINATION OF POLYCYCLIC HYDROCARBONS IN AIRBORNE POLLUTANTS. J. Chromatog., 36(2):436-444, 1968. 9 refs.

A method for the analysis of polycyclic hydrocarbons found in polluted air and tobacco tars is described in detail. The chromatography of polycyclic hydrocarbons involves compromises including the activity of the alumina, the depth of the adsorbent, and the amount of the ether, or other polar solvent used. Ultraviolet spectroscopy as a monitoring technique is not sufficiently sensitive. This lack of sensitivity may be the reason that column losses have been reported. Fluorescence as a monitoring technique is much more sensitive and must be used when benzo(a)pyrene is being measured, since the benzo(k)fluoranthene present in the benzo(a)pyrene fractions causes serious interference with measurements made at the characteristic benzo(a)pyrene peak at ca. 402nm.##

07832

R. Selucky, J. Novak, J. Janak

THE USE OF THE CHROMATOGRAPHIC EQUILIBRATION PROCEDURE FOR AIR POLLUTION STUDIES. DETERMINATION OF MINUTE AMOUNTS OF BENZENE, CHLOROBENZENE, AND NITROBENZENE IN AIR. J. Chromatog., 28(2): 285-292, 1967. 13 refs.

The equilibration technique was used for the determination of benzene in the presence of nitrobenzene and chlorobenzene. The applicability of the chromatographic equilibration technique for air pollution control was verified for the systems benzene-chlorobenzene, benzene-nitrobenzene, and for a ternary mixture of the three compounds. For field assays, invaluable advantages of the method used are: (1) Water does not interfere with the determinations when non-polar phase is used for the concentration-tube packing. (2) The extent to which individual components are trapped is proportional to their partition coefficients, i.e. usually inversely proportional to their volatility. Thus, the least volatile compounds that are present in the atmosphere usually at lowest concentrations, are most efficiently accumulated. (3) During sampling, care need not be taken of the exact volume drawn through the concentration tube, thus eliminating the use of clumsy-to-operate sampling devices. (4) The sampling procedure is very versatile and extremely simple, thus rendering the method suitable for field practice. Also the transport of the pocket-size tubular samples is convenient. (5) The overall time necessary to prepare and analyse samples of benzene in the presence of chloro- or nitrobenzene is about 30 to 60 min, as compared with standard procedures, where a complete analysis takes several hours. The equilibration method is therefore of considerable advantage in studying micro-climatic conditions and momentary surges of exhalates.**

07835

A. Edwinsyahi, A. L. DuBois, G. E. Moore, R. G. Thomas, J. L. Monkman

COLUMN CHROMATOGRAPHY AND SPECTROSCOPY IN THE ANALYSIS OF AIRBORNE POLYCYCLICS. J.Chromatog., 28(2):317-325, 1967. 16 refs

Analytical difficulties encountered during the separation (column chromatography) and measurement (spectrophotometric and fluorimetric) of polynuclear compounds are discussed. A glass tube 1.0 cm I.D. and 60.0 cm long is fitted with a teflon plug stopcock. The column is filled to a depth of 12 cm with a slurry of the deactivated alumina in cyclohexane. For ultraviolet absorption a Bausch & Lomb spectrophotometer and a Cary 14 recording spectrophotometer were used. For fluorimetric measurements a modified Aminco-Bowman spectrophotometer was used. The use of fluorescence is mandatory in the measurement of polycyclic hydrocarbons in air samples. Without its use, the analyst would be seriously handicapped with regard to sensitivity. There seems to be no evidence for losses on the chromatographic column and

accordingly no need to correct for such losses. It is possible that apparent losses may be due to interference from the background. The background may be due to overloading of the column or to incomplete separation of a mixture of hydrocarbons having a common structure. These hydrocarbons are likely to be of the two to three ring type. Overloading of the column and incomplete separation are different effects, but the influence on the chromatogram will be the same.##

07569

Jacobs, Morris B.; M. M. Braverman, and Seymour Hochheiser

CONTINUOUS DETERMINATION OF CARBON MONOXIDE AND HYDROCARBONS IN AIR BY A MODIFIED INFRARED ANALYZER. J. Air Pollution Control Assoc.; 9(2):110-116, Aug. 1959. 5 refs.

The estimation of hydrocarbons and carbon monoxide in small amounts in the ambient air was achieved by modification of the nondispersive type of infrared gas analyzer. Essentially the analyzer consists of an infrared source, a sample and comparison cell, a beam combiner and filter cell, a detector cell, an amplifier and a recorder. The sensitivity of the instrument can be increased by increasing the length of the sample and comparison cells, and by increasing the pressure of the sample gas. Water vapor has an absorption throughout the infrared region and is therefore an interference in the analysis of carbon monoxide and hydrocarbons. By saturating the incoming air stream with water vapor and adjustment of the controls the concentration of water vapor is constant and can be eliminated as a source of error. The daily variation of hexane and carbon monoxide during a typical day of high pollution in New York City is illustrated. The sensitivity of this instrument was increased sufficiently so that it could be used for the direct measurement of carbon monoxide in the ranges of 0 to 20 ppm and 0 to 50 ppm and of hydrocarbons such as hexane in the ranges of 0 to 5 ppm and 0 to 10 ppm.##

07575

Manita, M. D. and G. Kh. Ripp

SPECTROPHOTOMETRIC DETERMINATION OF LOW ATMOSPHERIC CONCENTRATIONS IN THE PRESENCE OF OTHER PRODUCTS LIBERATED DURING THE MANUFACTURE OF SYNTHETIC RUBBER. (Spektrofotometricheskii metod opredeleniya malykh kontsentratsii divinila v atmosfernom vozdukhe v prisutstvii drugikh produktov proizvodstva sinteticheskogo kauchuka.) Test in Russian. Gigiena i Sanit., 30(8), Aug. 1965. 1 ref. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(8):231-234, Aug. 1965.
CFSTI: TT66-51033/3

The spectrophotometric method for the determination of DV (1,3 butadiene) was tested under field conditions in the atmosphere around the factory manufacturing synthetic rubber SK. The maximum DV concentrations were 6.12 to 0.5 mg/cu. m. at

distances of 50 to 2000 m, respectively, from the source of pollution in the summer season, and 3.0 to 0.1 mg/cu. m. at the same distances in the autumn-winter season. Thus, the spectrophotometric determination of DV in the atmosphere in the presence of alpha-methylstyrene, isopropylbenzene, butane, and butylenes is based on measurements of the optical density of the isooctane solution of the mixture of wavelengths 320 and 345 millimicron in quartz cell with l equal 1 cm with an SF4 spectrophotometer. DV concentration in the solution is calculated from the provided formula. The sensitivity is 0.125 microgram/ml, the accuracy is within plus or minus 2.0%.##

07578

Kryiova, N. A.

THE SPECTROPHOTOMETRIC DETERMINATION OF DIMETHYLPHENYLCARBINOL AND DIMETHYL-PHENYL-P-CRESOL IN AIR. (Spektrofotometricheskoe opredelenie dimetilfenilkarbinola i dimetilfenilparakrezola v vozdukhe.) Text in Russian. Gigiena i Sanit., 30(9), Sept. 1965. 2 refs. Engl. transl. by Israel program for Scientific Translations, Hyg. Sanit., 30(9):275-279, Sept. 1965.
CFSTI: TT66-51033/9

The spectral characteristic of DMPC (dimethylphenylcarbinol) in the ultraviolet region was studied. The solvent was ethanol. The instrument was an FE-6 spectrophotometer. The calibration graph was checked against several synthetic samples prepared in the laboratory. The mean error lay within plus or minus 3.0%. Consequently, the calibration graph can be used for the determination of DMPPC (dimethylphenyl-p-cresol) in solutions. The sensitivity is 0.5 microgram/ml. The degree of conformity of DMPPC solutions to Beer's Law was studied and a calibration graph in the region of 270-280 millimicrons was constructed. The sensitivity at lambda equaling 279 millimicrons was 2 micrograms/ml. DMPC and DMPPC can best be absorbed by drawing air, at a rate of 0.5 l/min, through three Saltzev absorption vessels connected in series, each of which is filled with 5 ml ethyl alcohol and cooled with ice. Up to 90% DMPC and DMP PC is retained by the first absorber, and up to 10% in the second. The next step was concerned with the possibility of determining DMPC and DMPPC separately when present together. This mixture was analyzed by means of a modification of Vierordt's method, in which one component absorbs light at a wavelength at which the other is not detected. At lambda equaling 255 millimicrons, DMPPC solutions have an intense absorption whereas DMPC solutions have an insignificant absorption up to a concentration of 10 micrograms/ml, without producing any appreciable deviations. At lambda equaling 270 millimicrons both substances absorb intensely. The effects of phenol and acetone on the determination of DMPC and DMPPC were verified. Phenol interferes with the determination of the substances in question because of its considerable light absorption in the region 270-275 millimicrons. Acetone hardly interferes with the determination because even solutions containing 10 micrograms/ml of acetone cause only a slight degree of deviation (of the order of 0.01% to 0.02) in the regions used in the determination.##

07627

Sturgis, B. B.; W. F. Billet, J. W. Rozek, and S. B. Smith

THE APPLICATION OF CONTINUOUS INFRARED INSTRUMENTS TO THE ANALYSIS OF EXHAUST GAS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 81-91. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

The Infrared Analyser, applicable to analysis of the hydrocarbon component of exhaust gases, and the Exhaust Gas Analyser which analyzes exhaust gas simultaneously are described for hydrocarbons, carbon monoxide, and carbon dioxide. The installation, calibration, and operation of these instruments and their use for the analysis of exhaust gases are discussed. Extensive use of continuous methods of analysis outlined here has made possible large scale field surveys of vehicle exhaust gases as well as studies of the effect of engine variables on exhaust gas composition. (Authors' abstract, modified) ##

07628

Hurn, R. W.; R. J. Hughes, and J. O. Chase

APPLICATION OF GAS CHROMATOGRAPHY TO ANALYSIS OF EXHAUST GAS. In: Vehicle Emissions, SAE Tech. Progress Series, Vol. 6, Society of Automotive Engineers, New York, 1964, 98-101. (Presented at the Annual Meeting, Society of Automotive Engineers, Jan. 1958.)

Information providing historical reference to work and findings in the early stages of development of gas-liquid chromatography (GLC) techniques for separation of the hydrocarbons emitted in auto exhaust gas are reported. Both equipment and techniques are suitable for separation of the major portion of the hydrocarbon component of exhaust gas condensate into separate fractions with identification and quantitative measurement of each fraction. In general, however, determinations are limited to C7 or lighter hydrocarbons and do not include, or where included do not differentiate, the oxygenated products of combustion. In the procedure described, about 500 ml of raw exhaust gas are required for the determinations to be made. Information is given on the technique of analysis, exhaust gas sampling and transfer procedures, and on the identification of fractions separated by the GLC technique.

07692

Isfeld, H. and R. Buck

A METHOD FOR DETERMINING THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES. ((Eine Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen.)) Text in German. Brennstoff-Chem. (Essen), 47(3):79-81, March 1966. 2 refs.

The gas sample is passed through a small tube filled with silica gel on which organic compounds from the gas are absorbed, with the exception of CO2. These compounds are then desorbed by heating and oxidizing on platinum wool. In order to remove sulfur oxides and halogen compounds which are also absorbed, the gas is passed through silver wool which by chemo-sorption eliminates these compounds. Subsequently the gas passes through a gas washing bottle with Ba(OH)2 solution where the CO2 formed by combustion is absorbed. Its amount is determined by titration with oxalic acid. The applicable range of concentrations suitable for this method is 20 to 400 mg C/cu m, with 3% relative standard deviation. The laboratory procedure is described in detail, and calibration values are listed. The results of tests on 17 substances are also reported.

07706

Feldstein, M.; S. Balestrieri; and D. A. Levaggi

THE USE OF SILICA GEL IN SOURCE TESTING. Am. Ind. Hyg. Assoc. J.; 28(5):381-385, July-Aug. 1967. 9 refs.

This is a study of the adsorption of a large group of solvent vapors upon silica gel and their subsequent quantitative desorption. Esters, ketones, aromatic and aliphatic hydrocarbons, and halogenated hydrocarbons were among those studied. Except for certain low-molecular-weight hydrocarbons, the silica gel was extremely efficient for adsorbing organic solvents. In general, dimethylsulfoxide proved ideal for elution of adsorbed materials and for subsequent analysis by gas chromatography. It could not be used for hydrocarbon solvent mixtures or for higher boiling solvents. In these cases, carbon disulfide, alone or with water, was used for desorption. (Authors' summary)

07783

Hendee, D. F.

THIN-LAYER CHROMATOGRAPHIC SEPARATION AND SPECTROPHOTOFLUOROMETRIC IDENTIFICATION AND ESTIMATION OF DIBENZO(A,H)PYRENE. Environ. Sci. Technol., 2(3):205-206, March 1968. 10 refs.

Only two hexacyclic aromatic hydrocarbons containing the pyrene nucleus have been found in urban airborne particulate matter. An investigation of the application of thin-layer chromatography and spectrophotofluorometry to the identification of additional hexacyclic aromatic hydrocarbons containing the pyrene nucleus was undertaken to determine whether these compounds are indeed present in urban atmospheres before proceeding to quantitative analysis for them. Further experiments were conducted to produce a method of estimating the amount of dibenzo(a,e)pyrene in urban airborne particulate matter. Two-dimensional thin-layer chromatography was used in exploratory research to find out whether any dibenzopyrenes could be found in the air. The general patterns were not very reproducible. Dibenzo(a,e)pyrene, placed on the plate and

developed one-dimensionality, gave a higher Rf value than was obtained with the same system in the two-dimensional procedure. The identity of the components of each fluorescent area was investigated by collecting the fluorescent area and extracting. The fluorescence spectra obtained for the various fluorescent areas in a composite particulate sample taken in Birmingham, Alabama provide evidence for the presence of dibenzo(a,e)pyrene in urban airborne particulate matter. With a method using two one-dimensional separations and fluorescence spectra, the amount of dibenzo(a,e)pyrene in the Alabama composite was found to be approximately 100 micrograms per gram of benzene-soluble. The concentration of benzo(a)pyrene in Birmingham was approximately 1900 micrograms per gram of benzene-soluble and in Atlanta, approximately 730 micrograms per gram of benzene-soluble.##

07799

Ives, N. F. and Laura Giuffrida

INVESTIGATION OF THERMIONIC DETECTOR RESPONSE FOR THE GAS CHROMATOGRAPHY OF P, N, As, AND Cl ORGANIC COMPOUNDS. J. Assoc. Offic. Anal. Chemists, 50(1):1-9, Feb. 1967. 8 refs. (Presented at the 81st Annual Meeting, Association of Official Analytical Chemists, Washington, D.C., Oct. 10-13, 1966.)

Investigations were conducted to determine the degree of specificity and enhanced response of the thermionic detector (TD), using alkali metal salts. The test compounds included the triphenyl derivatives of group V (a) elements. Because of special interest in nitrogen response, several types of nitrogen compounds were included. The effects of varying jet diameter, carrier gas, and other operating parameters were also studied. Thermionic response to group V(a) elements in organic compounds was found to depend on the salt cation used in the TD. The magnitude of response was similar for different salts of the same cation. Increased response for phosphorus was 10,000 fold or better, for nitrogen about 100 fold, and for arsenic about 30 fold. With an unknown response, phosphorus can be distinguished from nitrogen or arsenic by comparing the thermionic and conventional flame responses. The detection of nitrogen in organic compounds was not affected adversely by using nitrogen as a carrier gas. With certain size flame jets, a significant increase in thermionic response can be obtained by substituting helium for nitrogen as the carrier gas. Detector stability was best with potassium salts and was better with rubidium than with cesium salts; KCl was preferred for phosphorus compounds and RbCl for nitrogen compounds.

07807

Altshuller, A. P.

APPLICATION OF REACTIVITY CONCEPTS TO EMISSIONS FROM DEVICE EQUIPPED AND UNEQUIPPED AUTOMOBILES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ([10])p., ([1967]). 12 refs.

Various manifestations of atmospheric photochemical reactions can be associated with the relative ability of various hydrocarbons to participate in these reactions. The ratings derived from such manifestations have been used to develop a number of hydrocarbon reactivity scales. These scales are utilized in evaluating the effectiveness of automotive exhaust control devices. The effectiveness of the devices as computed from reactivity scales is compared with total hydrocarbon measurements.

07830

Popov, V. A.

THE PRESENCE OF OXIDANTS IN THE ATMOSPHERE OF CERTAIN TOWNS IN THE U.S.S.R. ((Prisutstvie okisdantov v atmosfernom vozdukhe nekotorykh gorodov SSSR.)) Text in Russian. Engl. transl. Hyg. Sanit., 31(1-3): 3-8, Jan.-March 1966.

Oxidants in the air of certain towns of the Soviet Union were measured by the phenolphthalein method. The standard color scale was a mixture of an alcoholic-aqueous solution (3:2) of phenolphthalein and 1% borax solution. The maximum concentration of oxidants on the highways of Moscow and Baku on sunny days was as high as 0.1 mg/cu m, and on cloudy days did not exceed 0.03 mg/cu m. A study of this type of pollutants in Baku revealed their presence in the area of oil refineries at concentrations within 0.15 mg/cu m. On the other hand, the maximum value of oxidants in the vicinity of Batumi oil refinery was considerably lower (0.05 mg/cu m).**

07839

Dimitriades, Basil

METHODOLOGY IN AIR POLLUTION STUDIES USING IRRADIATION CHAMBERS. J. Air Pollution Control Assoc., 17(7):460-466, July 1967. 12 refs.

Experimentation in large irradiation chambers has been useful in providing insight into the chemistry of the photochemical smog formation problem. Initial efforts to reproduce the atmospheric phenomena artificially at controllable scale were successful in that gross atmospheric smog symptoms were observed in irradiation chambers. However, as the experimentation and evidence produced were becoming more elaborate, the question arose as to how much one could rely on chemical data in understanding and interpreting atmospheric phenomena. The question becomes highly pertinent in view of the difference in concentration levels between atmosphere and chamber work. This issue was discussed during recent American Chemical Society meetings, and the conclusions from presentations and discussions were as follows: (1) There is qualitative agreement between chamber data and atmospheric data wherever comparison is feasible. (2) There is need for more precise chamber work at concentration levels more nearly equal to those in the atmosphere. Experimentation in chambers under typical atmospheric conditions presents some special problems associated with the chamber design and chemical analysis. Chamber methodology has been the focus of considerable research effort, and it appears to be an important factor affecting further progress in air pollution research. This paper describes methods and techniques used at the Bartlesville Petroleum Research Center. (Author's abstract)

07850

Walsh, J. T. and D. H. Rosie

STUDIES OF THE GAS DENSITY CELL. J. Gas Chromatog., 5(5):232-240, May 1967. 9 refs.

The gas density cell as a gas chromatographic detector possesses the unique possibility of providing both quantitative and molecular weight information. Studies are reported in regard to optimum operational parameters for maximum cell response and upon the accuracy of quantitative and molecular weight measurements. The magnitude of cell response was found to be a function of (1) the value of reference and measuring gas flow rates, (2) the physical properties of the reference gas, and (3) the density change produced in the reference gas by sample vapor. Accuracies of 1-2% for per cent weight and 3-6% for molecular weights were obtained on a large variety of compound types over reasonably wide concentration and molecular weight ranges. An equation was developed which accounts for the variables upon which cell response is dependent and which permits comparison to other type detectors. (Authors' abstract)##

07879

Engel, C. R. and F. Sawicki

AZULENE PROCEDURE FOR CHROMATOGRAPHIC ANALYSIS OF AROMATIC AND HETEROCYCLIC ALDEHYDES, CARBOHYDRATES, AND OTHER ALDEHYDE PRECURSORS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, [12?]p., [(1967)]. 9 refs.

A new location method for many types of conjugated aldehydes and their precursors is introduced. Because the compounds of interest are neither fluorescent nor colored, they are difficult to locate once they are separated. This method, with azulene as the reagent, is compared with a number of other location methods. Evidence is presented for the location of aromatic aldehydes, furfural derivatives, sugars, dinitrophenylhydrazones, and amines on paper and silica gel plates with azulene. This location procedure was applied to the identification of 5-hydroxymethylfurfural in extracts of effluents from a coffee-roasting plant. Techniques described in this paper have been developed for eventual application to analyses of airborne particulate. (Authors' abstract, modified)##

07885

R. J. Lewis, R. Smith, F. Baker

AN ANALYSIS OF INSTRUMENT DOWNTIME FOR A LARGE AIR MONITORING NETWORK. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, [12]p., 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 12-16, 1967.)

There is a prevalence of opinion encouraged by company sales representatives that currently available continous air monitoring equipment is truly continuous and automatic. The word automatic as applied to present air monitoring instruments is defined by a detailed analysis of the type of instrument failures which can be expected. The experience is drawn from the operating reports and records of the Continuous Air Monitoring Project (CAMP). Failure of the instrument system can come about for many reasons, and is defined by the loss of anticipated valid data output. Three major causes for loss of data are instrument failure, personnel failure, and supply support failure. It is concluded that successful network operation of continuous air monitoring equipment demands careful design of support functions and personnel selection. A continual reanalysis of operating efficiency and upgrading of personnel training is mandatory. (Authors' abstract, modified)**

07A071

McCabe, J. R.

A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES - PHASE II Arnold Engineering Development Center, Aro, Inc. Arnold Air Force Station, Tenn.; Contract-AF 40 (600)-1200, -AEDC-TR-67-19, 91p.; Feb. 1967.
DDC: AD 807885

Details of transferring and concentrating contaminants from 150-cc stainless steel cryogenic traps to small volume glass traps more suitable to trace analysis are given. A description of the gas chromatographic equipment used in the analysis are given. A description of the gas chromatographic equipment used in the analysis, and the analysis procedures used, are presented. The chromatographic instrumentation, calibrations, and data assimilation procedures are described. Basic test results and observations concerning the utility of procedures used, along with comparative discussions of various aspects of Phase 2 compared with Phase 1, are noted. (Author's abstract, modified)

07B98

Wyant, R. E.; R. E. Scott, A. F. Fentiman, and R. H. Poirier

IMPROVED DETECTION AND IDENTIFICATION OF INCAPACITATING AND LETHAL AGENTS. Battelle Memorial Inst., Columbus, Ohio, Contract DA-18-035-AMC-179(A), Proj. 1C622401A104, BAI-6, 17p.; Jan. 1967. 11 refs. DDC: AD 810000

The search for specific, sensitive, and direct methods for functional groups or moieties was continued. The synthesis of reagents for the detection of lethal agents (organophosphorus-type agent) was emphasized. Materials that are capable of undergoing the second-order Beckman reactions that lead to detectable fragments were emphasized. Particular attention was directed to oximes that would produce triaryl methane dyes or aliphatic

mercaptans. Thus, through the high tinctorial strength of triaryl methane dyes, or the highly odoriferous nature of certain mercaptans, detection systems with enhanced sensitivity might be realized.##

07908

Zdrojewski, A.; L. Dubois, C. E. Moore, R. Thomas, and J. L. Monkman

FLUORESCENCE SPECTROSCOPY IN THE ANALYSIS OF AIR SAMPLES. Am. Chem. Soc., Div. Water, Air, Waste Chem., Preprint, 6(1):40-45, 1966. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry, Pittsburgh, Pa., March 1966.)

Column separations and ultraviolet measurements are accepted as almost the only procedure available for the analytical determination of polycyclic aromatic hydrocarbons in air samples. The air sample extract is passed through an alumina column and each fraction is scanned in the ultraviolet. All the fractions containing a compound detected by ultraviolet measurements are combined and a quantitative determination is made on the composite. Two analytical difficulties encountered in the use of this technique are one, low recoveries of some of the polycyclic hydrocarbons and two, the "background". To elucidate these two problems, ultraviolet absorption and fluorescence techniques were used separately and in conjunction. Each of the following possibilities for low recovery of polycyclics was investigated. 1. Lack of sensitivity of the technique. 2. Irreversible adsorption. 3. Tailing. 4. Incomplete separation. The minimum of limiting concentration required to get a measurable response was determined and is shown in a table. From results of column chromatography combined with ultraviolet and fluorescent measurements it was concluded that: the adsorption is reversible, and that tailing, for all practical purposes, is negligible. When working with standards only, recovery is not a problem. The results obtained by fluorescence measurements on air samples indicate that the spectrum of the so called background is identical to the spectrum of an air sample extract. Moreover, a curve of background fluorescence against the elution volume has the shape of a typical decay curve. It seems therefore that overloading of the column by a high concentration of unknowns is a possible explanation of the background.##

07981

Green, A. E. S.; D. T. Williams, R. S. Sholtes, and J. Bowling, Jr.

THE MIDDLE ULTRAVIOLET AND AIR POLLUTION. In: A. E. S. Green, ed.; The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt. 8, p. 158-169. 32 refs.

Currently in the air pollution field a great effort is underway to find and develop more specific methods of measuring contaminants.

It appears that ultraviolet spectroscopy would be an important tool in measuring these trace species. The important pollutants such as nitrogen dioxide, sulfur dioxide, and ozone all have strong absorption coefficients in the ultraviolet, as do many of the other lesser pollutants and the products of the photochemical reactions which play such a large role in smog formation. Both chemical and spectroscopic methods have their advantages and disadvantages. Perhaps the greatest importance in utilizing ultraviolet spectroscopy is that a program which complements the chemical program could be obtained. The two programs working together should indeed contribute significantly to the body of knowledge which is necessary to solve the air pollution problem.

08066

Wohlers, Henry C.

RECOMMENDED PROCEDURES FOR MEASURING ODOROUS CONTAMINANTS IN THE FIELD. J. Air Pollution Control Assoc., 17(9):609-611, Sept. 1967. 15 refs.

Although the perception of odorous contaminants cannot be precisely described, certain basic facts about human olfaction are known. With known facts or principles, it is possible to investigate odorous contaminants for air pollution control purposes. Odor remains, however, a very intangible commodity. Odorous contaminant investigations must be tailored to the individual problem or locality. Consequently, the methods described were designed for individuals who have working knowledge of either odor or air pollution problems. Background references are available for workers who are not familiar with either field. Generalized facts concerning odors as well as subjective and objective methods for measuring odorous contaminants in the field are described. The use of specific portions of the method depends upon each individual investigation. (Author's summary, modified)

08077

Johnson, F. A.

DETECTION OF ION LEVELS OF TETRAFLUOROHYDRAZINE IN AIR. Bubs and Hass Co., Huntsville, Ala.; Redstone Research Labs.; Contract DA-AMC-67-C-0655, S-137, 19p., June 1967.
DDC: AD 815960

Tetrafluorohydrazine was converted to fluoride ion by nitrogen dioxide and water. The fluoride ion was detected continuously by a commercial fluoride ion electrode. A 30-mV change in electrode potential was obtained for one part per million of N_2F_4 in the air. Various factors affecting sensitivity, stability, and speed of the detection system were considered. (Author's abstract)

08079

Keenan, Robert G.

CHEMICAL ASPECTS OF ENVIRONMENTAL HEALTH. Occupational Health Rev.Ottawa, 18(1):3-8, 1966. 39 refs.

Modern methods of physical and chemical analysis, as applied to biological materials, atmospheric samples containing gaseous or particulate contaminants, industrial process materials, intermediates, and finished products are discussed briefly. A discussion of the uses to be made of such analytical data includes: (1) the "normal" concentrations of certain metallic elements in body tissues and fluids; (2) the need to compare these concentrations with those developed analytically on samples from exposed subjects; (3) the comparison of atmospheric concentrations of contaminating substances found in the working environment with the A.C.G.I.H. Threshold Limit Values; (4) the analysis of industrial process materials, settled dusts, and finished products to help in assessing the total exposure of the worker to chemical elements. (Author's abstract, modified)

08081

Mercer, T. B.

CALIBRATION OF COULTER COUNTERS FOR PARTICLES ABOUT 1 MICRON IN DIAMETER. Rev. Sci. Instru., 37(11):1515-1520, Nov. 1966.

A linear relationship between particle volume and instrument response is confirmed for particles between 0.75 and 2.5 cubic microns, but this relationship may not hold for smaller particles. The implicit assumption of negligible surface conductance in derivations of this relationship is found acceptable for polystyrene spheres about 1 micron in diameter. A potential source of error in calibration is identified and allowed for. A relationship is developed between observed count and true count which allows coincident passage correction to be based on all available experimental points. The critical volume is found experimentally to be a function of particle volume. (Author's abstract)

08192

R. I. Fuistayev

COLORIMETRIC DETERMINATION OF SMALL QUANTITIES OF STYRENE IN THE AIR. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by R. S. Levine. National Bureau of Standards, Washington, D. C.; Inst. for Applied Tech., Vol. 3, p. 19-16, May 1960.
(Publ: TT 60-21475

The determination of small quantities of styrene is based on its nitration property and is made photocolorimetrically.

An experimental attempt was made to absorb styrene directly into the nitrating mixture. Absorption was made from a special bottle, the air of which was saturated with styrene vapor, by aspirating the test air through two absorbers connected in succession. Nitrated styrene vapor acquired a yellow color; the nitrated product was completely retained in the first absorber even when the air was aspirated at a rate of 1 l/min. To prevent the yellow color from fading it was necessary to change the medium as follows: after styrene vapors were absorbed from the air the content of the absorber was diluted with 3 ml of distilled water and neutralized by a 25% ammonia solution until litmus paper showed an alkaline reaction. Final colors were compared with colors yielded by standard styrene solutions in carbon tetrachloride.##

00136

Senderkhina, D. F.

DETERMINATION OF CHLORINATED HYDROCARBONS IN THE AIR BY THE METHOD OF MICRO-COMBUSTION. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 33-37, May 1960. CFSTI: TT 60-21985

The method described is based on the quantitative oxidation of chlorinated hydrocarbon vapor in a combustion chamber equipped with a platinum coil heated to redness. The combustion products are then passed through an absorber solution and the ionic chlorine determined nephelometrically. With an appropriately prepared standard scale accurate determinations can be made in solutions containing 0.001 mg of chlorine in 1 ml. Control tests were made with ethylene chloride, chloroform, carbon tetrachloride and trichlorethylene. A portable apparatus for the determination of chlorinated hydrocarbons in the air by the micro-combustion method was constructed. The micro-combustion method described proved to be accurate for the determination of thousandths of a milligram of chlorine within 30 to 60 minutes. A new micro-absorber is described which assures complete absorption of products of hydrocarbon combustion. Air samples are aspirated into gas pipettes filled with a saturated solution of sodium sulfate or into vacuum gas pipettes.##

00171

Forsicheva, N. I. and P. A. Rel'nikova

RAPID DETERMINATION OF SMALL QUANTITIES OF DIMETHYLANILINE IN THE AIR. Gigiena i Sanit., No. 5:49-52, 1952. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 1-5, Aug. 1960. CFSTI: TT 60-21911
CFSTI: TT 60-21911

A rapid colorimetric method is described for the determination of small quantities of dimethylaniline in the air, based on the formation of a yellow colored paranitrosobasic salt. The air aspiration and the colorimetric estimation with the aid of an artificial scale requires approximately 15 to 20 minutes; the dimethylaniline content per 1 ml of the air must be within 0.001 - 0.01 mg. The method is simple, requires no complex equipment and is suitable for dimethylaniline determination in the air of industrial premises at concentrations in the order of hundredths and thousandths of a milligram per liter. ACN##

08226

Likina, N. T. and G. L. Barodina

LINEAR-COLORIMETRIC METHOD FOR THE DETERMINATION OF CARBON DIOXIDE IN AIR. Gigiena i Sanit., 24(8):30-32, 1959. 6 refs. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 212-215, Jan. 1961.
CFSTI: TT 61-11149

A linear-colorimetric method for the determination of carbon dioxide in sewage system air is described. The advantages of this method over those used by the sanitary chemists are speed of the analysis and the ease with which it can be used under field conditions even at low air temperature, since the determining chemical reactions depends upon a solid absorber. Hydrazine-hydrate-N2H4. H2O is a good carbon dioxide absorber and it combines with basic fuchsin in solution to form an unstable colorless solution, the original fuchsin color is restored in proportion to the carbon dioxide concentration in the air. Best results are obtained with 125 ml of the CO2-containing air. This volume of air can be passed through the indicator tube for the determination of CO2 concentrations ranging between 0.5 and 9.0 percent. Results of experiments indicate that unsaturated hydrocarbons, gasoline vapor and small amounts of hydrogen sulfide affected neither the height nor the color in the indicators; however, when the concentration of hydrogen sulfide was 0.1 mg/li or more the color of the column faded almost completely. However, the maximum content on the hydrogen sulfide in the air of the sewage system never exceeded 0.007 mg/li.

08257

Haus, Fritz, Ingo Reichardt, and Wolfgang Steinbach

SIMPLE MEASURING ARRANGEMENT FOR RECORDING HYDROCARBON CONTENT. Staub (English translation), 27(6):18-19, June 1967. 11 refs.
CFSTI: TT 67-51608/6 (HC$2.00)

A method for using a batch-sampling gas-chromatograph with flameionization detector to record continuously the presence of hydrocarbons is described. Use of this measuring device is illustrated by several examples. Hydrocarbons are thermally ionized in a hydrogen flame in the flame-ionization detector. Flue gases of an oil stove with vaporization burner, flue gases of a medium-size waste incinerator, and automobile exhaust were

measured. The hydrocarbon content of the flue gas of an oil stove only exceeded that of the air in the laboratory above a combustion rate of 0.5 kg of oil per hour. With decreasing chimney draft the hydrocarbon content of the flue gases rose sharply, being accompanied by an increase of the Bacharach soot number. When the chimney draft was throttled to 0.1 mm W.G. at the maximum combustion rate, the concentration of hydrocarbons rose to 350 times the value of normal operation. The combustion phases in a medium size waste incinerator can be directly observed with the measuring device. Total hydrocarbon concentration in the exhaust of an automobile at various operating conditions is presented. In neutral, a slight increase in hydrocarbon concentration was recorded. During acceleration in neutral the concentration dropped immediately. The concentration varied when the position of the accelerator was changed. On a 14% grade, finally, the concentration dropped briefly and then rose considerably.##

08270

M. F. Fracchia, F. J. Schuette, P. K. Mueller

A METHOD FOR SAMPLING AND DETERMINATION OF ORGANIC CARBONYL COMPOUNDS IN AUTOMOBILE EXHAUST. Environ. Sci. Technol., 1(11):915-922, Nov. 1967. 24 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 152nd Meeting, ACS, New York, N.Y., Sept. 1966.)

Automobile exhaust was sampled at 1 liter per minute through a water trap and two bubblers in series. The bubblers contained aqueous acidified 2,4-dinitrophenylhydrazine. The carbonyl compounds in the water trap were precipitated with the hydrazine reagent. The hydrazones in the trap and in the bubblers were collected by filtration and extraction, dissolved in carbon disulfide, and analyzed by gas chromatography using a flame ionization detector. The water trap contained mostly formaldehyde. All aldehydes were quantitatively trapped in the first bubbler, and the ketones were determined from the hydrazones in the second bubbler. The role of potential interferences has been evaluated. Sampling efficiencies and analytical errors have been established for several compounds. Alkyl and aromatic carbonyl compounds obtained from selected automobiles under several operating modes are compared. More sensitive methods are needed for analysing carbonyl compounds in air, but a methodology is now available for studying combustion sources. (Authors' abstract)##

08285

W. Brieglob

GASCHROMATOGRAPH COLUMN CIRCUIT FOR ANALYSIS OF GASES IN CLOSED SYSTEMS FOR BIOLOGICAL AND BIOMEDICAL INVESTIGATIONS. [Gaschromatographische Kolonnenschaltung fur die Analyse der Gase in geschlossenen Systemen fur biologische und biomedizinische Untersuchungen.] Text in German. Deutsche

Versuchsanstalt fuer Luft- und Raumfahrt, Munich, Germany.
DLR-FB-66-60, 12p., Sept. 1966. 6 refs.
DDC: AD 803715

A variable gaschromatographic column circuit is described for measuring oxygen, nitrogen, carbon dioxide, carbon monoxide, helium, and argon gases as well as the lower hydrocarbons in a single run. Diagrams of the circuit in a specially developed Beckman gaschromatograph column and a chromatogram of an analysis are provided.##

08290

Vander Kolk, Alvin L.

SAMPLING AND ANALYSIS OF ORGANIC SOLVENT EMISSIONS. Am. Ind. Hyg. Assoc. J., p. 588-589, Nov.-Dec. 1967.

Stack emissions were evaluated for air pollution purposes by using both Mylar bag sampling and gas washing bottles containing normal hexane and orthoxylene. Analysis was done by gas chromatography. Agreement between the two sampling techniques was good, and each method has its advantages and disadvantages. (Author's abstract)

08295

Boettner, E. A. and Benjamin Weiss

AN ANALYTICAL SYSTEM FOR IDENTIFYING THE VOLATILE PYROLYSIS PRODUCTS OF PLASTICS.
Am. Ind. Hyg. Assoc. J., p. 535-540, Nov.-Dec. 1967. 1 ref.
(Presented at the American Industrial Hygiene Association Meeting, Houston, Texas, 1965.)

Techniques are described for determining the identity and toxicity of the pyrolysis products of plastics. Differential thermal analysis (DTA) and thermogravimetric analysis (TGA) determine the temperature at which the plastic melts, the temperature at which it goes through physical and/or chemical change (oxidation or reduction), and the temperature at which it undergoes weight losses. The identity and quantity of the combustion products are determined with a controlled combustion furnace, utilizing the temperature information obtained by DTA and TGA. The combustion products emitted by the furnace are separated by gas chromatographic techniques and analyzed by infrared absorption, ultraviolet absorption, other gas chromatographic techniques, and mass spectroscopy. The results obtained utilizing polyvinyl chloride are described. (Author's abstract)

08296

Valori, P. C. Melchiorri, A. Orsilo, and G. Alimenti

VOLATILIZATION AND DECOMPOSITION OF AROMATIC POLYCYCLIC HYDROCARBONS DURING THE USUAL PROCEDURE FOR THE CONCENTRATIONS OF EXTRACTS OF

ATMOSPHERIC DUST. ((Sulla volatilizzazione e la decomposizione degli idrocarburi policiclici aromatici nel corso degli abituali procedimenti per la concentrazione degli estratti di pulviscolo atmosferico.)) Text in Italian. Nuovi Ann. Igine Microbiol. (Rome), 17(4):311-324, 1966. 17 refs.

Research is described on a series of commercially available hydrocarbons which are found in polluted air (naphthalene, acenaphthalene, fluorene, phenanthrene, anthracene, 9,10-dihydroanthracene, pyrene, fluoranthene, chrysene, 1,2-benzanthracene, naphthacene, perylene, 3,4-benzopyrene, 1,12-benzoperylene, anthanthrene, 1,2,5,6-benzanthracene, and coronene). The sample hydrocarbons were evaporated at sedium heat (hot water bath at 90-95 deg C.), or dried with a jet of filtered air, or with a jet of nitrogen; samples were either evaporated to dryness or to a liquid volume of 2 ml. The per cent loss for all three techniques is tabulated. The highest proportion of sample loss (up to 100 percent) is generally encountered when dry heat is used to evaporate to dryness. The per cent loss varies with the individual hydrocarbon, and is generally correlated with volatility. Other modes of sample loss are discussed: decomposition, reaction with other chemicals, oxidation, and ultraviolet photodecomposition. The data are discussed with reference to experimentation with air-borne carcinogens. These data were to be used in the development of a procedure for the analysis of polluted air.

08116

Louis, Rudolf

PROTON MAGNETIC RESONANCE ANALYSIS OF GASOLINES. ((Protonenresonanzanalyse von Motorenbenzinen.)) Text in German. Erdoel Kohle (Hamburg), 19(4):281-287, April 1966. 9 refs.

Gasolines exhibit typical proton magnetic resonance spectra. Their qualitative and quantitative interpretation is discussed in detail for 19 super and regular gasolines, covering characteristic hydrocarbon groups as well as single components and additives. Thus, far-reaching conclusions about composition and quality of gasolines are possible with a minimal expenditure of time. The range of application of this method is shown by a comparison with GC-, FIA-, infrared- and gas chromatographic analyses.

08121

Stefanescu, A. and I. Stanescu

THE DEGREE OF DANGER CAUSED BY THE INFLUENCE OF AROMATIC POLYNUCLEAR HYDROCARBONS DURING THE MANUFACTURING PROCESS OF CARBON BLACK. I. THE DANGER OF ANTHRACENE AND THE DETERMINATION OF THE ANTHRACENE CONTENT OF THE AIR. ((Der Gefahrdungsgrad unter Einwirkung der aromatischen polycyklischen Kohlenwasserstoffe beim Fabrikationsprozess von Russ. I. Die Gefahrdung durch Anthracen und die Bestimmung des Anthracengehaltes der Luft.)) Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 12(3):182-189, 1966.

The toxic effect of anthracene was strongest in workers who handle crude anthracene, while the ones who worked with refined anthracene showed very few detrimental effects. The skin cancer noted in anthracene workers is most likely caused through contact of the skin with the polynuclear hydrocarbons which are impurities in anthracene oil. The maximum allowable concentration of anthracene recommended by the American Conference of Governmental Industrial Hygienists is 0.1 mg./cu m of air. A new method for the determination of anthracene in air during the production of carbon black is described. The hydrocarbons were absorbed on active carbon and desorbed using benzene vapor and oxygen-free nitrogen. The desorption apparatus is illustrated. The amount of anthracene obtained was determined by gas-fluid separtitioning chromatography. The chromatograms illustrated show that besides anthracene, several lighter and heavier unidentified components were obtained, most likely higher condensed polynuclear hydrocarbons. The degree of danger caused by anthracene to workers in the manufacture of carbon black is tabulated, showing the variations caused by different work places, work time, and concentrations of the toxic substance.##

08158

Brink, D. L., and J. F. Thomas, and D. L. Feuerstein

MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR. II. ANALYTICAL ASPECTS. TAPPI, 50(6):276-285, June 1967. 29 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 21-24, 1966.)

Gaseous and liquid products isolated by pyrolysis of kraft black liquor, were analyzed qualitatively and quantitatively using gas-liquid chromatography with detection by flame ionization. More than 60 compounds were detected in the pyrolysis liquid and at least 32 of these were present in the pyrolysis gas. Using the microcoulometric titration system, hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and at least 10 unidentified sulfur-containing components were detected in the pyrolysis products; 7 of the major components were determined quantitatively. Using combchromatography and the methods of detection noted, the identities of methyl mercaptan, dimethyl sulfide, and dimethyl disulfide were verified and tentative identifications of several other sulfur-containing products were also made. Hydrogen, oxygen, nitrogen, methane, carbon monoxide, ethane, carbon dioxide, and acetylene were resolved and determined quantitatively. Hydrogen sulfide, methyl mercaptan, and five unidentified components were also qualitatively detected. Sulfur present in pyrolysis residues was determined using a wet oxidation procedure. A powerful analytical method has been developed for detailed study of the effects of recovery furnace operation on such emissions and it should prove to be a valuable aid to industry. With adequate development, pyrolysis carried out independently of gaseous, liquid, and solid products could provide an answer to complete odor control; in addition, isolation of organic by-products may be feasible. AA##

00156

Cave, G. C. B.

THE COLLECTION AND ANALYSIS OF ODOROUS GASES FROM KRAFT PULP MILLS. PART II: A LABORATORY STUDY OF THE COLLECTION OF POLLUTANTS FOR ANALYSIS. TAPPI, 46(1):5-11, Jan. 1963. 5 refs.

An experimental study was made of the performance of traps, in collecting kraft-mill pollutants from an air stream. The traps were in a mixture of dry-ice and acetone. Some traps in the train were empty; others contained ethylbenzene as a solvent. A convenient experimental method is described for artificially producing a polluted air stream, and for evaluating the performances of traps. The distribution was found of hydrogen sulfide, sulfur dioxide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide among the traps of the train. The effect of flow-rate, volume of solvent, and trap design on trap performance was measured. The effect of varying the degree of air turbulence in an empty cold trap was studied. It was confirmed that cold ethylbenzene is a satisfactory solvent for all the pollutants except hydrogen sulfide. For this latter pollutant, an aqueous solution of cadmium was used to trap it. A study was included on the losses of the pollutants that might occur on extended storage of their ethylbenzene solutions. Apparatus and a procedure are described for the concentration of the original ethylbenzene solution of pollutants, to improve the sensitivity of the method. (Author's abstract)##

00157

Cave, G. C. B.

THE COLLECTION AND ANALYSIS OF ODOROUS GASES FROM KRAFT PULP MILLS. PART III: THE ANALYSIS OF COLLECTED POLLUTANTS BY GAS CHROMATOGRAPHY. TAPPI, 46(1):11-16, Jan. 1963. 8 refs.

The qualitative and quantitative analysis of kraft-mill pollutants in ethylbenzene by using gas chromatography is discussed. Columns of tri-m-cresyl phosphate and of Carbowax 1540 are proposed for use at 15 and 85 C. These columns permit the resolution of all known kraft-mill pollutants. Techniques are described for qualitative analysis. They include the two-column method, and graphs prepared by this method are presented for homologous series of mercaptans, ketones, esters, and normal alcohols. It is emphasized that the unequivocal identification of an unknown pollutant is rarely possible by gas chromatography alone. Quantitative analysis is also described, including the preparation of standard solutions and the presentation of prepared calibration curves. These curves were straight lines. The use of an ultrasensitive detector, the ionization chamber, is briefly discussed. (Author's abstract)##

08433

R. B. Tupeev

THE DETERMINATION OF METHOXONE IN AIR. ((Metody opredeleniya
getoksona v vozdukhe.)) Hyg. Sanit. (English translation of:
Gigiena i Sanit.), 32(4-6):72-76, April-June 1967. 4 refs.
CFSTI: TT 67-51409/2

The optimum conditions were established for the determination
of methoxone by the method of wet combustion with a mixture
of sulfuric acid and potassium dichromate, followed by
iodometric determination of the liberated chlorine. The
sensitivity was found to be 0.080 mg methoxone in the
analytical volume. A sensitive method was devised for the
determination of methoxone based on its hydrolysis with
concentrated sulfuric acid, with the liberation of formaldehyde,
followed by the photometric determination of the latter with
chromotropic acid. The sensitivity was found to be 0.010 mg in
the analytical volume. The hydrolysis of methoxone with
concentrated sulfuric acid in the presence of
chromotropic acid provides a more sensitive and accurate method
for the determination of this substance.##

08446

L. I. Gavrilova

METHODS FOR THE DETERMINATION OF SODIUM AND BUTYL 2,4-
DICHLOROPHEN-OXYACETATES IN AIR. (Metody opredeleniya natrievoi
soli i buty-lovogo efira 2,4-dikhlorfenoksiuksusnoi kisloty v
vozdukhe.) Hyg. Sanit. (English translation of: Gigiena i
Sanit.), 32(4-6):194-196, April-June, 1967. 4 refs.
CFSTI: TT 67-51409/2

Different colorimetric methods for the determination of
different preparations of 2,4-D in air were tested in order
to determine which was most suitable for routine sanitary work.
The 2,4-D herbicides are used in agriculture in the form of
liquid aerosols and dust, while under actual working conditions
they are present as dust. They should therefore be sampled on
FPP-15 filters placed in metal cartridges, by means of
electrical aspirators. It is recommended that the air for
sampling 2,4-D herbicides be drawn up at a rate of 10 l/min.
This was tested under working conditions and found to be the
optimum rate.##

08471

Yuhi, Kensosuke

STUDIES ON THE CHEMICAL ESTIMATION METHOD OF INDUSTRIAL
ENVIRONMENT. II. DETERMINATION OF TRICHLOROETHYLENE, CHLOROFORM
AND METHYLCHLORIDE BY THE PYRIDINE-FORMALIN METHOD. Text in
Japanese. Japan. J. Hyg. (Tokyo), Vol. 21, p. 607-609,
Feb. 1967. 12 refs.

A simple method for the determination of trichloroethylene, chloroform and benzyl chloride was developed, utilizing formaldehyde to stabilize the color developed by the reaction of pyridine and halogen compounds (Fujiwara reaction). An air sample was passed through 5 ml. of pyridine-formaldehyde solution (9:1 ratio), and the solution mixed with 1 ml. of sodium hydroxide solution; amounts of halogen compound were determined spectrophotometrically. The method is both sensitive and specific. 1.5 gamma of trichloroethylene, 2.5 gamma of chloroform and 1.0 gamma of benzyl chloride were measured in 5 ml. of sampling solution.##

08490

Kol'kovski, Peter

A NEW COLOR REACTION FOR VAPORS OF CERTAIN AROMATIC HYDROCARBONS. ((O novoi tsvetnoi reaktsii parov nekotorykh aromaticheskikh uglevodorodov.)) Text in Russian. Zh. Analit. Khim. (Moscow), Vol. 22, p. 456-458, 1967. 9 refs.

A new color reaction has been found for benzene, toluene and xylene vapors using a solution of cesium disulfate in fuming sulfuric acid supported on silica gel. Linear-colorimetric methods have been developed on the basis of this reaction for determining benzene, toluene and xylene vapors in the air of industrial establishments.##

08519

Keith, Walter G.

THE NRL TOTAL HYDROCARBON ANALYZER. In:A.L. Alexander and V.H. Platt, Status of Chemical Research in Atmosphere Purification and Control on Nuclear-Powered Submarines (Fifth Annual Progress Report), Naval Research Lab., Washington, D.C., NRL-6491, p. 18-22,Jan. 11, 1967. 7 refs.
CFSTI, DDCI AD 648505

Sampling of atmospheric gases on submarines for later analysis in the laboratory has always been a problem. The judicious choice of equipment and techniques is paramount in obtaining a representative sample that will not change during storage and transit. The NRL Total Hydrocarbon Analyzer fulfills a need for a method of analysis which can be used aboard ship to determine the total hydrocarbon concentration. The instrumentation and procedure of operation for this analyzer are described. The use of the instrument has been made more practical by devising a scheme for purifying the shipsd air to make it suitable for use as an air supply for the detector. Other applications of this analyzer are mentioned.

08589

Runte, Helga

CARCINOGENIC SUBSTANCES IN WATER AND SOIL. XVIII. THE DETERMINATION OF POLYCYCLIC, AROMATIC HYDROCARBONS USING COMBINED

THIN-LAYER CHROMATOGRAPHY AND FLUORESCENCE MEASUREMENT. (Kanzero anzerogene Substanzen in Wasser und Boden. XVIII. Die genze Substanzen in Wasser und Boden. XVIII. Die mittels Rasch Dunnschichtchromatogtaphie und Fluoreszenzmessung.) Text in German. Arch Hyg. Bakteriol. (Munich), 151(3-4):193-201, Aug 1967. 25 refs.

A method is described for the separation of polycyclic,aromatic hydrocarbons from extracts of water, soil, and dust by two-dimensional mixed thin-layer chromatography and their quantitative determination by fluorescence measurement. The behavior of these compounds is described: pyrene, fluoranthene, 1,2-benzanthracene, 3,4-benzpyrene, 3,4-benzfluoranthrene, 10, 11-benzfluoranthrene, 11,12-benzfluoranthrene, perylene, indeno(1,2,3-cd) pyrene, and 1,12-benzperylene. These hydrocarbons are detected at concentrations of 0.05-1.0 micro./ml. at wavelengths from 400 to 650 milli microns. This study was limited by the use of 365 milli microns as the standard wavelength. Limitations, such as reduced intensity, possible errors, and correction factors are discussed. The simplicity, speed, and sensitivity of the method recommend it.

08592

Luft, K. F.; G. Rensaier; and K. H. Soner

NON-DISPERSIVE INFRARED GAS ANALYSIS WITH THE UNOR APPARATUS. (Nichtdispersive Ultrarot-Gasanalyse mit dem UNOR.) Text in German. Chem. Ingr. Tech. (Weinheim), 39(16):937-945, Aug. 1967. 7 refs.

A single or double ray apparatus can be used for nondispersive infrared gas analysis. The new one-ray apparatus is schematically illustrated and its measurement principles and technical performance are described. Measurement sensitivity and interference effects are discussed, taking into consideration the underlying physical principles. The UNOR apparatus is illustrated and its technical applications are outlined. This method permits sensitive, continuous readings of pollutants in the atmosphere, the determination of single components in stack, exhaust and waste gases, as well as the determination of synthetic gas components.

08643

Dubois, L.; A. Edrojewski; and J. L. Monkman.

MEASUREMENT OF BENZO(a)PYRENE, BENZO(k)FLUORANTHENE AND BENZO(g,h,i)PERYLENE BY ULTRAVIOLET SPECTROSCOPY. Nitrochim. Acta, No. 5:839-842, 1967. 8 refs. (Presented at the Congress on Occupational Medicine, Budapest, Hungary, Sept. 1966.)

Published ultraviolet data for BaP in air may be grossly in error, particularly those published before 1960. It is not possible to measure BaP in air samples with accuracy, using the 401 nm peak, unless BaP is present alone (no BkF). The BaP detection limit measurable at 401 nm by ultraviolet is too high. The horizontal measurement technique produces results of greater accuracy than the base line technique. Better analytical values for BaP are obtained

if, instead of using the peak at 401 nm, the 385 nm peak is used. BkP can be precisely measured using the 307 nm peak and a horizontal drawn at 310 nm. The technique for determining benzo((a))pyrene, benzo((k))fluoranthene, and benzo((g,h,i))perylene respectively in microgram amounts by UV absorption measurements is described. The feasibility of using this technique to analyze air samples has been investigated.

08649

Dubois, L.; A. Zdrojewski, and J. L. Monkman.

COMPARISON OF THREE METHODS FOR TRACE ANALYSIS OF POLYCYCLICS. Mikrochim. Acta (Vienna), No. 5:903-911, 1967. 16 refs. (Presented at the Anachem Conference, Detroit, Mich., Oct. 11, 1966.)

Several analytical techniques for the determination of polycyclic aromatic hydrocarbons in air have been evaluated. Two solvents, benzene and cyclohexane, were compared for effectiveness in the preliminary preparation of the air sample. To identify and measure the polycyclics, the techniques of ultraviolet absorption and fluorescence were used. Air sample extracts were analyzed with and without prior chromatographic separation. A rapid chromatographic procedure using benzene as elutant was employed for th e first time. The extract aliquot or eluate fraction was chromatographed on fully activated alumina using benzene as the eluting solvent. BaP and BkP are eluted from such a column in 30 minutes or less in a total eluate volume of perhaps 50 ml and the two hydrocarbons are determined by fluorescence emission. Work in progress suggests that benzene may be replaced in this application by the less toxic toluene. By any method used the BaP values found were in good agreement. The agreement between the various BaP values was poor, suggesting not all were of equal validity. The highest, and also least accurate, BaP values seem to be associated with the use of benzene as extractant, or ultraviolet absorption as a measuring technique. (Authors' abstract)

08681

Chapman, Robert L.

AN INSPECTION METHOD FOR AUTOMOBILE HYDROCARBON EMISSION. J. Air Pollution Control Assoc., 10(6):463-468, Dec. 1960. 5 refs. (Presented at the 53rd Annual Meeting, Air Pollution Control Assoc., Cincinnati, Ohio, May 22-26, 1960.)

There has been a need for a simple, inexpensive and extremely sensitive method for the discriminate detection of hydrocarbons in auto exhaust, that may be used by the law enforcing agencies. The use of the flame ionization detection method to fill this need, is discussed. The operation possibilities and limitations of this method are discussed.

08762

Reis, Morris

GUIDE TO THE SELECTION OF METHODS FOR MEASURING AIR POLLUTANTS. Preprint. World Health Organization, Geneva (Switzerland), WHO/AP/67.39, 115p., 1963. 2 refs.

The contents of this review are: main purposes of air pollution investigations, units for expression of results, atmospheric sampling, selection of sampling procedure and apparatus, gas analysis methods, automatic sampling and monitoring instruments, recent advances in instrumentation for gas analysis, analysis of polycyclic aromatic hydrocarbons and carcinogenic air pollution, and indicators and other rapid methods for identification or measurement of air pollutants.##

08838

Hoover, Gary N., Charles E. Nathaway, and Dudley Williams

INFRARED ABSORPTION BY OVERLAPPING BANDS OF ATMOSPHERIC GASES. Appl. Opt., 6(3):481-487, March 1967. 9 refs.

The spectral transmission of carbon monoxide, nitrous oxide, and mixtures of the two has been studied in the 2200 per cm region, where overlapping absorption bands occur. With spectral slit widths sufficiently large to include several absorption lines, it was found that the observed spectral transmittance of a mixture is equal to the product of the transmittances of the components measured separately, provided that sufficient nitrogen is added to give the same total pressure for all samples. This result was also obtained for overlapping bands of nitrous oxide and methane in the 1300 per cm region. The present work confirms earlier studies of overlapping bands of CO2 and water vapor. An investigation of the possible breakdown of the multiplicative property of transmission for narrow spectral slit widths was inconclusive. (Authors' abstract, modified)##

08848

Vander Kolk, Alvin L.

SAMPLING AND ANALYSIS OF ORGANIC SOLVENT EMISSIONS. Am. Ind. Hyg. Assoc. J., 28(6):588-589, Nov.-Dec. 1967.

Stack emissions were evaluated for air pollution purposes by using both Mylar bag sampling and gas washing bottles containing normal hexane and orthoxylene. Analysis was done by gas chromatography. Agreement between the two sampling techniques was good, and each method has its advantages and disadvantages.##

08889

Dubois, L. and J. L. Monkman

THE ANALYSIS OF AIRBORNE POLLUTANTS. In: Pollution and Our Environment: Conference Background Papers. Vol. 3. Montreal, Canadian Council of Resource Ministers, Paper D25-3, p. 1-20, 1967. 23 refs. (Presented at the National Conference, Canadian Council of Resource Ministers, Montreal, Oct. 31-Nov. 4, 1966.) Available from the Canadian Council of Resource Ministers, 620 Dorchester Boulevard West, Montreal, Canada, $10.00 per volume.

Some specific problems in the sampling and analysis of pollutants are discussed illustrating some discrepancies in data already obtained. The analysis of H2S and NaP are emphasized to indicate that some data may be unreliable. Conclusions drawn from the discussion indicate that measuring techniques and sampling methods should be considered as an integrated whole. To avoid possible conflict, the use of direct reading recording instruments is preferred to batch sampling devices and methods. If the instrument or batch sampling method does not produce accurate results, efforts to measure a particular pollutant should be abandoned until a satisfactory method has been developed. Much is being said about the setting of standards and criteria. If methods do not exist which can determine with accuracy the limit chosen, it is better to avoid, at least temporarily, the setting of a limit. All factors must be considered, including current data on toxicity and current ability to measure before deciding on a standard or limit. Data are not an end in itself but merely an intermediate from which conclusions and correlations may be drawn. It is better to spend some effort and money in the development of a better measurement technique than to continue to use methods which are known to be unsatisfactory.

09111

Chapman, Robert L.

THE ROLE OF OPTICS IN AIR POLLUTION MONITORING. Opt. Spectra, 1(3):15-18, 1967.

Optical instrumentation and analysis techniques commonly used in air pollution monitoring are described. Beginning with a definitive descriptions of major air pollutants and their causes, the article traces the development and use of optical instruments for this purpose from the "beginning" some two decades ago to present. Comprehensive descriptions of instruments and techniques currently in use and a brief discussion of developments that would still further enhance the value of optical instrumentation in this application are presented.##

09221

Kohler, H. and H. J. Eichoff

A RAPID METHOD FOR THE DETERMINATION IN ATMOSPHERIC DUST. ((GUIDE Schnellmethode zur Bestimmung von Schadstoffen, aromatischen

Kohlenwasserstoffen in Luftstaub.)) Text in German. Z. Anal. Chem. (Berlin), 232(6):401-409, Nov. 24, 1967. 5 refs.

The dust is sampled onto a cellulose asbestos filter and is extracted with benzene in a Soxhlet apparatus. The polycyclic hydrocarbons are then isolated from the extract, using 2-dimensional thin-layer chromatography on aluminum oxide-cellulose acetate. The eluted spots are analyzed by fluorospectroscopy, usually at normal temperature in solution or, in special cases, at lower temperatures in a solid state. About 70 percent of the polycyclic aromatic hydrocarbons originally contained in the dust are detected, as determined by a test with labelled 3,4-benzpyrene. The apparatus used is diagrammed. (Authors' summary, modified)

09234

Martinelli, Giorgio

THE CONTINUOUS CONTROL OF AIR POLLUTION WITH INDUSTRIAL ANALYZERS. ((I) controllo continuo dell'inquinamento atmosferico con analizzatori industriali.)) Text in Italian. Termotecnia (Milan), 21(10):559-565, Oct. 1967.

For protection against air pollution from increased vehicular traffic, urbanization, and industry, Italy established a law on air pollution control in August 1966. Some provisions of the law are cited. A monitoring system for continuous measurements of air samples involves wind direction, registration of concentrations, determination of pollutants, and the emitter. Better results could be obtained from a network of monitoring stations at various cities, and a plan is proposed for their establishment and operation, where continuous measurement would also be made of air temperature and humidity, concentrations of SO2, H2S, NO2, CO2, CO, and hydrocarbons. Photographs showing equipment and apparatus for the stations are reproduced. A schematic diagram depicts the picofluo apparatus for SO2 measurements; an electrical cell for measuring H2S is also shown. The URAS infrared analyzer is used to measure CO2. Analyses for CO, hydrocarbons and dust are discussed, along with the equipment for air pollution monitoring in Frankfurt, Germany.

09333

Lisl W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-R-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determination of Acetone, Acid and Alkali Contaminants; Benzene, Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol;

Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.##

09162

Papa, Louis J.

GAS CHROMATOGRAPHY-MEASURING EXHAUST HYDROCARBONS DOWN TO PARTS PER BILLION. Preprint, Society of Automotive Engineers, 20p., 1967. 25 refs. (Presented at the Mid-Year Meeting, Chicago, Ill., May 15-19, 1967, Paper 670094.)

Several methods for determining hydrocarbons in automotive exhaust are presented and discussed. These include: nondispersive infrared, ultraviolet, flame-ionization detection, and gas chromatography. A gas chromatographic method is presented for determining individual hydrocarbon components in automotive exhaust. The minimum detectable concentration of each hydrocarbon is one part per billion (ppb) volume/volume. The method has thus far detected over two hundred hydrocarbons of all classes, i.e., paraffins, olefins, and aromatics, in exhaust. The total analysis time is 25 to 30 minutes. A technique for collecting the exhaust sample in small plastic bags is described along with a brief study on the selection of suitable bag material. Technique for sampling, calibration, and standardization are also discussed. Applications of the method are presented along with a discussion of the results. (Author's abstract)##

09163

Peaslee, H. W.

MEASURING THE TOTAL HYDROCARBONS IN DIESEL EXHAUST. Preprint, Society of Automotive Engineers, 11p., 1967. 19 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670089.)

In order to simulate diesel exhaust of known composition, weighed amounts of various high-boiling hydrocarbons were evaporated into a stream of heated air. These mixtures were sampled continuously and the hydrocarbon contents measured with a heated flame ionization detector (FID). The evaporator unit and FID were operated at various temperatures and 375 F was optimum as regards percentage of input material accounted for (95-100%, for paraffins through C16), fast response, and repeatability. The FID was then used at various temperatures total hydrocarbons in exhaust from a 1-cyl diesel engine. Again 375 F was optimum for obtaining maximum apparent hydrocarbon concentration, fast response, and repeatability. Finally, FID measurements were obtained at 375 F on exhaust from the engine at various operating conditions, to assess the effects of operating variables on hydrocarbons. Increasing compression ratio and temperatures of the inlet air and crankcase oil were effective ways of lowering hydrocarbons. Some principles for valid sampling and measurement of diesel exhaust hydrocarbons are discussed. (Author's abstract)##

09140

Westveer, J. A.

CORRELATION OF EXHAUST EMISSION TEST FACILITIES. Preprint, Society of Automotive Engineers, 8p., 1967. 4 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670165.)

Current legally specified test procedures for measuring hydrocarbon and carbon monoxide concentrations in vehicle exhaust gases contain intrinsic test variables which significantly affect test results. These variables constantly hamper efforts to correlate test data generated at one or more exhaust emission test facilities. Some of the more prominent test variables such as vehicle repeatability, test driver repeatability, instability of calibrating gases and changing ambient test conditions and the success of various measures which were undertaken to reduce or eliminate the influence of some the variables on test repeatability and facility correlation are described. It is recommended that one of the facilities be designated as a control facility which would be responsible for establishing and maintaining a set of primary gas concentrations. Particular attention should be placed on the driving patterns of the test drivers, as deviations from the prescribed patterns alter test results. Standardization of the analytical instruments improved correlation. Particular emphasis should be placed on matching and reducing the sizes of the internal cavities, such as water traps, filters, and common manifolds, etc. The size of sample cells should be standardized especially in the hydrocarbon sample train as the hexane to propane response varies with the sample cell length. The infrared analytical instruments should be located in an area relatively free of harsh drafts as the abrupt temperature changes may cause the instrument calibrations to change momentarily. The analyzers should be mounted in a console or cabinet type enclosure to reduce the possibility of rapid temperature changes within the analyzer case. Vehicle exhaust emissions are affected by barometric pressure changes. The existing ambient barometric pressure should be recorded for each test and appropriate correction factors applied to the test results to compensate for barometric pressure differences. Circulating a test vehicle among facilities for correlation purposes has remained a standard practice within the industry because it is presently the best known method for obtaining comparative emission data. The development of devices and of procedures which will eliminate the major variables will significantly simplify the present correlation problems.

09165

Hill, H. L. and J. H. Sonley

A FOUR CHANNEL CHROMATOGRAPH FOR RAPID GAS ANALYSES. Lab. Pract., 17(1):55-58, Jan. 1968.

A multiple column chromatograph is described which quickly and accurately analyzes gas samples for hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide and hydrocarbons. The total time for an analysis is just under six minutes. Operator fatigue is reduced to a minimum and electronic integrators enhance the

accuracy. The cost of the equipment (3,250 pounds) is justified by the large number of samples. Apparatus specifically described include: the sampling system, detectors, the electrical system, and oven units. The operation and calibration of the equipment are briefly discussed.##

09169

Wilson, N. H. and G. H. Duff

INDUSTRIAL GAS ANALYSIS; A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to "trace" of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the "on-stream" determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.##

09186

Valori, P. and A. Orelia

CHROMATOGRAPHIC SEPARATION OF POLYCYCLIC AROMATIC HYDROCARBONS. A METHOD FOR CONCENTRATION AND PRELIMINARY PURIFICATION OF EXTRACTS FROM SAMPLES OF ATMOSPHERIC DUST. (Separazione cromatografica degli idrocarburi policiclici aromatici. Metodo per la concentrazione e la preliminare purificazione degli estratti di campioni di pulviscolo atmosferico.) Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), 17(5):351-382, Sept.-Oct. 1966. 15 refs.

Different techniques in chromatographic separation are discussed; they generally yield different results. Another method is described which involves: a) the concentration of polycyclic constituents by absorption on alumina; b) the purification of extracts from tars and colored materials; and c) a preliminary separation of polycyclic aromatic hydrocarbons into two large fractions. The differences between levels of hydrocarbons determined by classical method and by this new one are considerable, for example, 0.98 and 1.72 micrograms/100 cu m air for phenanthrene respectively, and 5.80 and 13.56 for 1,12-benzperylene. This method can be easily adapted for analyses of more complex materials and represents a "small preparative analysis" in the gas chromatography of polynuclear compounds.

09412

Dubois, L.; T. Teichman, B. B. Thomas, and J. L. Monkman

SULPHUR COMPOUNDS IN URBAN AIR. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transformation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organization for Economic Co-operation and Development, Paris, Directorate for Scientific Affairs, Paper 8, Dec. 1967, p. 63-73. 5 refs.

Three sampling stations were set up using glass fiber filters. All filters were carefully washed to reduce the relevant blank levels as much as possible. Measurements were made of dust loading, lead, polycyclics and sulphate. Using hot aqueous extraction, sulphate blank values were determined on a larger group of glass fiber filters. Sulphate blanks on organic filter media are much lower than for the glass fiber type. Suitably low blanks have only been achieved for polycyclic, lead and sulphate blanks. Results currently being obtained for sulphate in air are shown in histograms. The effect of wind direction has been applied to the results. There seems to be a rough correlation between the three stations. Peaks tend to occur on weekends. Dust and sulphate air loadings are given in tables. Values are summarized for three months, with some average values for the same months obtained 10 years previously in the same city at another location one mile distant. Glass fiber sheet appears to be quite unsuitable for the measurement of sulphate or sulphuric acid in air since it is analytically unsound to try to measure sulphate if the total sulphate blank is as large, or larger, than the quantity being measured.##

09515

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

A GUIDE TO OPERATION OF ATMOSPHERIC ANALYZERS. SDPH-3-60, 14p., May 1960.

Methods for both manual and continuous automatic sampling and analysis of the common air pollutants are described. Experiments are described for the measurement of sulfur dioxide using the West method. Total oxidant content of the atmosphere is analysed using the Neutral Buffered Potassium Iodide Method. C1 through C5 atmospheric hydrocarbons are monitored and analysed. Guides to the operation of atmospheric analysers are reviewed.##

09579

Saunders, W. H. and J. B. Maynard

CAPILLARY GAS CHROMATOGRAPHIC METHOD FOR DETERMINING THE C1-C12 HYDROCARBONS IN FULL-RANGE MOTOR GASOLINES. Anal. Chem. (U. S.); 40(3):527-535, March 1968. 13 refs.

A capillary gas-liquid chromatographic method has been developed to determine the individual C3 - C12 hydrocarbons in full-range motor gasolines. The analyses are conducted on a 200-foot squalane capillary column in less than 2 hours. Approximately 240 chromatographic peaks are observed in the analysis of an average gasoline; 180 of these (amounting to 96-99 percent wt of the sample) have been specifically identified. The column temperature and column inlet pressure are both programmed to obtain resolution of close-boiling hydrocarbons. Standard deviations and the 95 percent confidence limits are given for the quantitative repeatability and reproducibility of the method. Chromatographic peak identifications and the detailed quantitative composition of typical premium and regular-grade gasolines are presented, as well as the detailed composition of the American Petroleum Institute Prototype Fuel No. 1 -Premium Leaded Reference. Changes that can be made in the temperature and pressure programs to obtain resolution of specific groups of hydrocarbons are discussed. With modifications of present sampling procedures, the method could easily be applied to analysis of the individual hydrocarbons found in automotive exhaust gases. (Authors' abstract, modified)

09597

Engle, Carole and Eugene Sawicki

RAPID ITLC FLUORIMETRIC METHODS FOR THE ASSAY OF PHENALEN-1-ONE AND 7H-BENZ(DE)ANTHRACEN-7-ONE IN POLLUTED URBAN ATMOSPHERES. Preprint. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((23))p., Feb. 1968. 8 refs.

Through the use of glass-fiber paper impregnated with silica gel (called instant thin-layer chromatography, or ITLC), the rapid determination of phenalen-1-one (PO) and 7H-benz(de)anthracen-7-one (BO) is facilitated. One method is introduced for the specific determination of PO, and one method for the determination of both PO and BO at the same time. Both methods are superior to previous sensitivity. In addition, they give reasonable accuracy and precision. Samples from urban atmospheres and air pollution source effluents can be analyzed rapidly for PO and BO by these methods. Analysis of one sample of organic extracts would take less than 1/2 hour; analysis of a dozen samples would take less than 3 hours. For those laboratories without instrumentation the amount of PO and BO can be estimated by eye after separation; eight analyses for either compound can be accomplished in about 20 minutes. (Authors' abstract)

09736

De Schweitzing, Hannibal, Sol S. Nelson, and Harold G. Eaton

CRYOGENICALLY TRAPPED TRACE CONTAMINANTS ANALYZED BY IONIZING GAS CHROMATOGRAPHY. Hamper, Inc., Inc., Falls Church, Va., Contract AF 41(609)-2958, Task 793002, SAM-TR-68-88, 15p., Aug. 1967.
CFSTI, DDC: AD 662330

The concentrations of microcontaminants in a sealed environmental system were determined quantitatively. The separation and identification of the cryogenically trapped trace contaminants were accomplished with liquid gas chromatography using a flame ionization detector. Thirty-nine sets of samples were taken during a manned simulator run; 39 sets from a similar run; one sample set from a trapping efficiency run. The compounds contained in the sample cylinders were identified by their time of elution from a column and the amount measured with the aid of peak areas. The response characteristics of the chromatograph were calculated from responses obtained with standard mixtures. (Authors' abstract) modified)

09738

Berner, Assaf and Hanna Reichelt

THE ROTATING-SLIT AEROSOL SPECTROMETER (ROSL-SPECTROMETER): PROTOTYPE. In: Aerosol Research at the First Physics Institute. Vienna Univ., Austria, p. 1-18, Jan. 1968. 3 refs.

A new aerosol centrifuge is described. Particle-size spectra resembling those of the conifuge are produced; their selectivity, however, is considerably better. Aerosols produced by nebulising monodispersed latex suspensions are analysed by the centrifuge. The different locations and are completely separated. (Authors' abstract)

09888

Fisher, Jerome F.

CALIBRATION STUDIES OF A NEW SUB-MICRON AEROSOL SIZE CLASSIFIER. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 17p., 1967. 12 refs. (Presented at the 153rd Meeting, American Chemical Society, Miami Beach, Florida, April 10-14, 1967.)

The size-fractionating characteristics of a new aerosol classifier operating in the size range 0.015 to 0.5 micron were investigated with homogeneous aerosols of zinc ammonium sulfate, polystyrene latex spheres, and sodium chloride cubes. Size analyses were carried out by electron microscopy. Characteristic deposition curves were nearly identical in the small-particle collection zone and agreed with data for methylene blue spheres. For the zone above 0.2 micron the curves differed significantly, probably because of charging differences of the various aerosols. Preliminary application of the classifier to ambient air sampling has yielded size distribution data for lead in urban Cincinnati. (Author's abstract, modified)

10038

Meyer, E. T.

FLASH PHOTOLYZED REACTIONS MONITORED BY TIME-OF-FLIGHT MASS SPECTROMETRY. Sandia Corp., Albuquerque, N. Mex.,

Aerospace Sciences Div., SC-RR-68-162, 20p.; April 1968. 28 refs. (Presented at the "Symposium on Applications of Mass Spectrometry to Gas Phase Reactions," 155th National Meeting of the American Chemical Society, Division of Water, Air, and Waste Chemistry, San Francisco, Calif., April 6, 1968, Paper 55).
CFSTI: TID 4500 (51ST ED.)

The techniques of flash photolysis and time-resolved mass spectrometry have been combined for the study of fast gas phase reactions. The apparatus provides an incident ultraviolet light flux of 1.0 x 10 to the 18th power quanta per cm2 per flash and a spectrometer sensitivity of 5 x 10 to the minus 8 power mole per liter. Time resolution is 1.5 micron sec. at successive 50 microns sec intervals. The following chemical systems have been investigated: 1) nitrogen dioxide sensitized reaction between hydrogen and oxygen; 2) decomposition of nitromethane; 3) termolecular recombination of iodine atoms in the presence of nitric oxide; and 4) reaction of excited iodine (2P1/2) atoms with methyl iodide. The most promising development for pollution studies seems to be the use of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitrogen dioxide as a sensitizer and primary reactant. It should be possible to explore the reaction kinetics of nitrogn dioxide and various hydrocarbons with this technique. The mass spectrometer sensitivity limit of 1 part per 100,000 will not permit, however, reproducing the dilution factor normally experienced in the actual atmospheric environment (approximate range 0.01 to 1 part per 10 to the 6th power).##

10089

Rui'kovski, P.

INDICATOR METHOD FOR DETERMINATION OF XYLENE VAPOR IN THE AIR. (Indikatoren metod za opredelyane na ksilolovi pari v'v v'zdukha.) Text in Bulgarian. Khim. Ind. (Sofia), 39(2): 76-78, 1967. 11 ref

An indicator method based on a color reaction was developed for determining the xylene concentration in the atmosphere. The indicator is prepared by treating 0.3-0.4 mm. silicate with 0.5 l./g of a 2% solution of Co(SCN)2. 4H20 in concentrated sulfuric acid. A mm. long glass tube 0.4 mm. in diameter is filled with the indicator and is then standardized for xylene concentrations of 0 to 0.5 mg./l. by passing 500 l. air through the tube, or for concentrations from 0 to 25 mg./l. by passing 100 l. air through the tube. The distance over which the color change from orange to blue occurs is then recorded as a function of xylene concentration. The method has a sensitivity of 0.01 mg./l. and an accuracy of 20%. It can be used in the presence of aliphatic hydrocarbons but not in the presence of toluene, benzene, or benzene derivatives.

10238

Acutyunov, Yu. I. and E. I. Geller

THE ACCURACY OF CHROMATOGRAPHIC ANALYSIS OF FLUE GASES WHEN USING THERMOCATALYTIC DETECTORS. Thermal Eng. (English

translation of: Teploenergetika) 14(10):94-97, April 1968 7 refs.

Thermocatalytic detectors, used to analyse flue gases, operate on the principle of measuring the heat of combustion of the eluted components in the carrier gas flow. Platinum wires, incorporated into an unbalanced Wheatstone bridge, are measured for their changed resistances during catalytic combustion with the eluted gases. The theoretical basis for the relationship between input voltage and measured resistances is explored. On combustion of the eluted component by the wire, an additional amount of heat is liberated, raising the temperature of the wire's surface a discrete amount. In experimental verification of the derived relationships, a KhT-4 chromatograph was used for automatic analysis of minute constituent of combustibles in boiler stack gases. A low-temperature detector of catalytic combustion was employed. Theoretical and experimental values for temperature of the heated wire and for internal current, depending on the variations in supply voltage, differ by not more than plus or minus 10-15%.##

10282

Dimitriades, B.

METHODS FOR DETERMINING NITROGEN OXIDES IN AUTOMOTIVE EXHAUSTS. Bureau of Mines, Washington, D. C.; BI 7133, 29pp.; May 1968. 10 refs.

Five direct and indirect methods for determining nitrogen oxides in automotive exhausts have been evaluated from the standpoint of accuracy and applicability in current exhaust studies. These methods are: Static oxidation in tank, Bureau of Mines method, Chevron Research method, phenoldisulfonic acid method, and direct measurement of NO. Results showed that methods requiring conversion of nitric oxide to nitrogen dioxide as a part of the analytical procedure are subject to errors introduced by the instability of NO2. The extent of some of these errors has been determined, and procedures have been developed to minimize undesirable influences. On the basis of the results obtained from this study, recommendations are made regarding procedures for batch type or continuous measurement of nitrogen oxides in exhaust streams.##

10489

Rufolini, J. J.

GAS PHASE TITRATION OF ATMOSPHERIC OZONE. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control (8)p., April 1968. 9 refs.

Ozone can be selectively removed from a gas stream containing a variety of oxidants. Oxidant analyzers can be made specific for ozone by incorporating a small gas reaction chamber on the instrument. Possible interferences from hydrogen peroxide, n-butyl hydroperoxide, peroxyacetyl nitrate, nitrogen dioxide, and peracetic acid are discussed. (Author's abstract)

10668

Dubois, R.; C. J. Baker; A. Sdrojewski, and J. L. Monkman

CORRELATION OF THE BLACKNESS INDEX OF HI-VOL AIR SAMPLES WITH THE POLYCYCLIC HYDROCARBON CONCENTRATIONS. Preprint, Department of National Health and Welfare, Ottawa, (Ontario), Occupational Health Div.; ((24)) p.; 1958. (Presented at the 51st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn.; June 23-27, 1958, Paper 58-124.)

The darkness of a soiling index sample being due to products of combustion it would be interesting to find out if a relation could be established the blackness index or the dark colored fraction of the sample, and the polycyclic hydrocarbon concentration. Having deduced such a relation one could use this blackness index to indirectly measure the polycyclics in air samples. The time involved in measuring the blackness (a few seconds for a sample) is insignificant as compared to two days required for a complete determination of polycyclics in an air sample. The relation between the blackness index and the concentration of benzo((a))fluoranthene (BkF) and consequentley of polycyclics, vary from one station to the other. Each relation is characteristic of a given station. Preliminary results indicate that the curve are different from one city to the other although the difference from one station to the next or from one month to the next is more important in some cases. The relationship between the blackness index and the concentration of BkF or polycyclic is different from one month to the next. For a given blackness index, the concentration of BkF is lower in summer than in winter, and for a given amount of particulate matter, the concentration of BkF is also lower in summer. It then follows that the dark material is different, from summer to winter. The blackness index seems to be a poor indicator of the polycyclic concentration in air samples and it would be unwise to use it to make such measurement unless a standard curve for a given city has been prepared.##

10673

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc.; Minneapolis, Minn.; 24p.; 1958. 21 refs. (Presented at the 51st Annual Meeting of the Air Pollution Control Association, St. Paul,Minn.; June 1958, Paper 58-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, micro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

10755

Jager, J.

UTILIZATION OF QUASILINEAR FLUORESCENCE SPECTRA IN ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBON. Atmos. Environ., 2(5):393-396, May 1968.

The utilization of quasilinear fluorescence spectra in the analysis of polynuclear aromatic hydrocarbons is proposed. Quasilinear fluorescence spectra of many polynuclear hydrocarbons, but also enable them to be determined directly in mixtures with satisfactory accuracy, provided some specific conditions are strictly adhered to. The method of obtaining the quasilinear fluorescence spectra is briefly described. (Author's abstract)##

10767

Smith, Charles G., Carl A. Nau, and Charles H. Lawrence

SEPARATION AND IDENTIFICATION OF POLYCYCLIC HYDROCARBONS IN RUBBER DUST. Am. Ind. Hyg. Assoc., J. 29(3):242-247, May-June 1968.

A spectrophotometric technique is described for determining the presence of polycyclic aromatic hydrocarbons in furnace black, vehicular tire rubber, and lung tissue, utilizing benzene and immiscible solvent system extraction followed by thin-layer chromatography on cellulose with N,N-dimethylformamide as developer. By use of this procedure, furnace black and new and aged vehicular tire rubber are found to contain 3,4-benzypyrene, 1,2-benzypyrene, fluoranthene, and pyrene in quantities which are not diminished by processing, aging, or wear. In a further application of the procedure it was established that commercial furnace black and furnace black deposited in the lungs of monkeys are similar in that both contain adsorbed 1,2-benzypyrene, pyrene, and possibly fluoranthene, and two unidentified fluorescent compounds. They are dissimilar in that the furnace black from monkey lungs contains no coronene or 3,4-benzypyrene. (Authors' abstract)

10772

Yasamoto, Robert K., and Warren A. Cook

DETERMINATION OF ETHYL BENZENE AND STYRENE IN AIR BY ULTRAVIOLET SPECTROPHOTOMETRY. Am. Ind. Hyg. Assoc. J., 29(3):230-241, May-June 1968.

In the production of styrene, it is important to be able to determine ethyl benzene and styrene in the presence of each other as an indication of sources of dispersion of vapors from the closed reaction system. The air is drawn at a fixed rate through a fritted-glass bubbler containing spectro-grade isooctane. The absorption of ultraviolet light at wavelengths of 268 mu for the ethyl benzene and 291 mu for the styrene is used as a measure for the amounts of these compounds collected from the air. This method has the advantages of sampling over a wide range of concentrations, of specificity, and of facility in both field and laboratory phases. (Authors' abstract)

10955

Arito, H., H. Soda, and H. Matsushita

GAS CHROMATOGRAPHIC DETERMINATION OF POLYNUCLEAR HYDROCARBONS IN PARTICULATE AIR POLLUTANTS. Ind. Health, 5(3-6):253-259, Dec. 1967.

An attempt to simplify procedure for analysis of polynuclear hydrocarbons in particulates in town air was carried out. Vacuum sublimation method was employed to extract organic materials from the particulates instead of the method with a Soxhlet apparatus. The sublimate was dissolved in small amount of benzene and the solution was submitted to direct gas chromatographic analysis by utilizing a flame ionization detector or an electron capture detector. It was proved that further purification of the sublimate by partition was unnecessary in this method. Seven polynuclear hydrocarbons including benzo(a)pyrene were determined on the collected particulates from the air by this method. (Author's abstract)##

10960

Chapman, R. L.

AIR POLLUTION CONTROL SYSTEMS. Instr. Control Systems, 41(8):79-82, Aug. 1968.

The methods for measuring the major air pollutants are reviewed briefly. Some of the problems involved in calibration of instruments are discussed.##

10964

H. J. Davis

GAS CHROMATOGRAPHIC DETERMINATION OF BENZO(A)PYRENE IN CIGARETTE SMOKE. Anal. Chem., 40(10):1583-1585, August 1968.

An analytical method which is shorter and more versatile than the fluorometric method for the determination of benzo(a)pyrene in cigarette smoke is described. Gas chromatography with an electron capture detector is found to measure as little as 1 ng of BaP with satisfactory precision. The electron capture detector is basically an ionization detector utilizing a helium glow discharge as the electron source capable of operation at temperatures up to 400 degrees C.##

11030

Hanst, Philip L. and John A. Morreal

DETECTION AND MEASUREMENT OF AIR POLLUTANTS BY ABSORPTION OF INFRARED LASER RADIATION. Preprint, 27p., 1968. (Presented

at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-91.)

A technique of detecting gaseous air pollutants by means of absorption of laser radiation is under development at the NASA Electronics Research Center. The iodine infrared laser and the carbon dioxide infrared laser are forced to emit spectral lines which fall on the infrared absorption bands of atmospheric pollutants. The attenuation of a laser line when passed through an air sample is the measure of the pollutant concentration. The narrow spectral width of the laser emission permits sensitive detection, minimizes interference between pollutants, and allows penetration of atmospheric water bands. The collimation and high power outputs available from lasers permit transmission of the radiation over long straight paths through the atmosphere and over long folded paths in multiple-pass absorption cells. A sample of absorbing gas placed within the laser cavity forces the emission of the selected wavelengths. With a one-half kilometer path to a retro-reflector and back, it is predicted that the following concentrations of air pollutants will be detected by means of the indicated laser lines: carbon monoxide at 2 parts per million in air (ppm), using the 10.53 micron carbon dioxide line; sulfur dioxide at 1.5 ppm, using the 9.08 micron carbon dioxide line; and ozone at 0.15 ppm, using the 9.52 micron carbon dioxide line. It seems feasible to extend the technique to other pollutants such as nitrogen dioxide, methane, butane, and peroxy acetyl nitrate. Continuing effort is being devoted to development and construction of the laser transmitting and receiving equipment. Field testing is planned for the near future.##

11061

H. W. Thomsen, W. Guse

LATEST STATE OF DEVELOPMENT OF INSTRUMENTS FOR THE CONTINUOUS MONITORING OF GAS EMISSIONS. Staub (English translation), 28(3):53-61, March 1968. 17 refs.
CFSTI: TT 68-50948/3

For the measurement of gaseous emissions, testing methods using chemical analysis are used for emission control based on random sampling while automatic gas analyzers are employed for continuous concentration control. The different types of measuring instruments, their possibilities and limitations are explained, and difficulties occurring during gas cleaning are considered. Practical experience is available which has been gained in many years during the operation of gas cleaning installations and of analyzers for continuous measurement of sulphur dioxide present in flue gas. (Authors' summary)##

11068

C. E. Bagel

DIRECT SPECTROPHOTOFLUORIMETRIC ANALYSIS OF COMPOUNDS ON PAPER AND THIN-LAYER CHROMATOGRAMS AND PHOROGRAMS.
Preprint, Public Service, Cincinnati, Ohio

National Air Pollution Control Administration, ((7))p.; ((1968)) 12 refs.

Direct spectrophotofluorimetric analyses can be coupled with paper or thin-layer electrophoresis, and paper or thin-layer chromatography. It is simple and offers many advantages. Neither time nor compound is lost in extraction or elution. A thin-layer or paper chromatographic or electrophoretic spot can be examined immediately after separation. Since no expensive cells are needed, there are no breakage costs. Characterization is enhanced through the use of quenchofluorimetric techniques. Thus, direct spectrophotofluorimetric techniques. Thus direct spectrophotofluorimetric analysis has great potential in trace characterization and trace quantitative analysis of complex mixtures. It approaches colorimetric analysis in simplicity and speed and surpasses it in sensitivity, and the amount of information that can be obtained from one analysis. (Author's abstract, modified)##

11091

Sawicki, E.

MICRODETERMINATION OF BENZO(a)PYRENE IN AIRBORNE PARTICULATES AND AIR POLLUTION SOURCE EFFLUENTS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((8))p., ((1967?)) 4 refs.

The particulate collected from the urban atmosphere is extracted with an organic solvent and then separated alongside pure benzo(a)pyrene (BaP) with alumina thin-layer chromatography. The unknown and standard spots are eluted, their solutions are evaporated, and the residues are dissolved in concentrated sulfuric acid. Readings of standard and test spot solutions are taken at F 470/520 with the spectrophotofluorimeter or with a filter fluorimeter containing a primary filter peaking at 460 millimicrons and a secondary filter peaking at 565 millimicrons.##

11092

Stanley, Thomas H.

SPECTROPHOTOMETRIC DETERMINATION OF BENZO(a)PYRENE IN AIRBORNE PARTICULATES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((8))p.; 1968. 5 refs.

Airborne particulates collected from polluted atmospheres on glass-fiber filters are extracted exhaustively with an organic solvent. These extracts are carefully reduced to tarry residues through evaporation and then separated on thin-layers of activated alumina. The fluorescent area of pure benzo(a)pyrene and a corresponding area of the sample are removed from the TLC plate and eluted. Solutions of the pure compound and the unknown are spectrophotometrically measured between 4000 and 2400 angstroms. Wavelengths 3900, 3820, and 3750 angstroms are used to determine the amount of benzo(a)pyrene present in the sample.##

11168

Reid, Frank H. and Walter R. Halpin

DETERMINATION OF HALOGENATED AND AROMATIC HYDROCARBONS IN AIR BY CHARCOAL TUBE AND GAS CHROMATOGRAPHY. Am. Ind. Hyg. Assoc. J., 29(5):390-396, July-Aug. 1968.

The preparation and use of a simple charcoal tube is described for the collection of air samples for the determination of several commonly encountered halogenated and aromatic hydrocarbons of industrial hygiene significance. A rapid and efficient desorption procedure is employed. Specific parameters are presented for quantitative determination by gas chromatography. The method provides an easily applicable technique with the advantages of minimum field sampling equipment; and rapid, specific, accurate and economical determinations at atmospheric concentrations ranging from a few ppm to several times the threshold limit value. (Authors' abstract)

11169

Romano, August T. and Hal B. H. Cooper

SAMPLING AND ANALYSIS. Chem. Eng., 75(22):182-186, Oct. 14, 1968.

Knowledge of the types and rates of emissions from a source or group of sources is fundamental to appraising an air pollution problem. Three factors are critical in source testing and analysis: measuring gas properties in the duct, withdrawing representative samples, and accurate analysis.

11218

Stanley, Thomas W., Myron J. Morgan, and James E. Meeker

APPLICATION OF ITLC AND FLUOROMETRY TO THE ESTIMATION OF 7H-BENZ(de)ANTHRACEN-7-ONE AND PHENALEN-1-ONE IN ORGANIC EXTRACTS OF AIRBORNE PARTICULATES FROM 3-HOUR SEQUENTIAL AIR SAMPLES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ([1]8)p., Aug. 1968. ([5]) refs. (Presented at the 156th Annual Meeting, American Chemical Society, Division of Water, Air, and Waste Chemistry, Atlantic City, N.J., Sept. 1968.)

Instant thin-layer chromatography (ITLC) was performed by use of glass-fiber paper impregnated with silica gel to separate 7H-benz(de)anthracen-7-one and phenalen-1-one found in acetone extracts of airborne particulates from 3-hour sequential air samples. Only 15 minutes was required to separate 0.2 to 1.25 mg. of the crude extract with pentane:ether, 19:1 v/v. Compounds to be assayed were located on the chromatogram by use of relative Rf values and changes in fluorescence colors in an acidic environment under long-wavelength ultraviolet light. Direct fluorometric measurement and assaying at F 410/550 and F 500/600

indicated concentrations ranging from 3 to 67 micrograms/1000 cu m of air for 7H-benz(de)anthracen-7-one and from 0.3 to 17 microgram/1000 cu m for phenalen-1-one. For 7H-benz(de)anthracen-7-one the precision of the method calculated as relative standard deviation was plus or minus 3.6% with a detection limit at 5 nanograms. For phenalen-1-one, precision was plus or minus 1.6% with a detection limit at 2 nanograms. The method was applied in analysis of 3-hour sequential air samples taken with Hi-Vol samplers over two 24-hours periods during January 1968. (Authors' abstract)##

11237

J. C. Chipman, A. J. Hocker, and John Chao

MEASURING AND EVALUATING AUTOMOBILE EXHAUST HYDROCARBON EMISSIONS BY INTERRELATED TECHNIQUES. Preprint, California Air Resources Lab., Los Angeles, ((19)) p., 1968. 10 refs. (Presented at the 61st Annual Meeting, American Institute of Chemical Engineers, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 51-E.)

The smog forming potential of exhaust gas from a 210 car survey was determined. This potential is defined in terms of reactivity units. Exhaust hydrocarbon emissions were measured by nondispersive infrared, ultraviolet and flame ionization analyzers. The measurements of these analyzers were correlated with the reactivity of the exhaust gas. The results show that each analyzer is capable of delineating the smog potential of gasoline powered vehicles. Hydrocarbon emissions were also correlated with engine classes. The emission level differences for concentration are larger than those obtained on a reactivity or mass rate basis. (Authors' summary)##

11270

O'Keeffe, Andrew E.

PROGRESS REPORT: PERMEATION STANDARDS FOR TRACE GAS ANALYSIS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((6)) p., ((1968)). 1 ref. (Presented at the 152nd Meeting, ACS, Division of Water, Air and Waste Chemistry, New York, N. Y., Sept. 16, 1966.)

A microbottle for dispensing liquefiable gases at rates lower than can be attained by an original method has proved useful. The several steps of its construction and filling, are largely self-explanatory. The glass envelope is drawn down to a size that will not permit passage of the spherical head; the coefficients of expansion of head and envelope should not differ widely. For dispensing liquefiable gases incompatible with FEP Teflon a similar microbottle having a tetrafluoroethylene (TFE Teflon) barrier has proved suitable. For dispensing fixed gases a microbottle similar to that described above, but made of metal, is connected directly to a cylinder of gas. A Bourdon gauge assures that this "infinite" gas source has not been

accidentally exhausted. This version is incapable of providing a gravimetrically calibrated primary standard; indirect calibration will usually be necessary. Substitution of thin-wall TFE Teflon tubing for the FEP tubes of the original device adapts it for dispensing substances whose properties are such as to limit their permeation rates at undesirably low values. This modification has extended the range of usefulness of permeation tubes, operating at room temperature, to include compounds as large as cumene.##

11476

Andreeshcheva, N. G.

THE EFFECTS OF CERTAIN AROMATIC HYDROCARBONS IN THE AIR. ((O sanitarno-toksikologicheskoi otsenke nekotorykh aromaticheskikh uglevodorodov v atmosfernom vozdukhe.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(5-6):13-17, April-June 1968. ((10)) refs. CFSTI: TT 68-50589/3

A spectrophotometric method of determining beta-nitrochlorbenzol (BNCB), and 3,4-dichloraniline (3,4-DCA) in the air is elaborated. The findings point to a definite relation of the threshold values of smell to the changes in the chemical structure of the substance due to introduction of nitro-amino- and chlorine groups into the benzol ring. The action of chlorine products on the light sensitivity of eyes becomes stronger as additional chlorine groups, besides the nitro- and amino- groups, are being introduced into the benzol ring.##

11485

Kasnina, N. I.

DETERMINATION OF STYRENE IN AIR BY PAPER CHROMATOGRAPHY. ((Opredelenie stirola v vozdukhe s pomoshch'yu bumazhnoi khromatografii.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(5-6):215-217, April-June 1968. ((2)) refs. CFSTI: TT 68-50549/3

A chromatographic method was developed for the determination of styrene in air, based on the reaction of styrene with mercury acetate in an ethanol medium. The minimum amount of styrene which can be so determined is 0.5 micrograms. Quantitative determination of styrene is based on the color intensity of spots developed on the paper by reaction with diphenylcarbazide.##

11486

Petrova, N. S. and G. N. Shevkun

HYGIENIC ASSESSMENT OF ODOR OF NONMETALLIC BUILDING MATERIALS. ((K voprosu o gigienicheskoi otsenke zapakha nemetallicheskikh stroitel'nykh materialov po ikh vozdukhu.)) Hyg. Sanit.

(English translation of: Gigiena i Sanit.), 33(5-6):218-220, April-June 1968. [(2)] refs.
CFSTI: TT 68-50449/2

Testers were first studied to ensure that they have a normal olfactory threshold (as described below). The testers then evaluated the odor of the building material under test (Vnukhova and Denisenko). The odor of several coatings and other materials was tested. A varnish coating based on styrene with epoxy ester was tested for its odor 8 months after its application to the substrate. In the testing of a special adhesive with a phenolformaldehyde base, an olfactory sensation was produced by 0.6-0.8 ml air; i.e., it produced a "moderate odor". Every material tested by this method (taking into account the specified conditions of its envisaged use) may be categorized in terms of its odor. The method makes it possible to appraise the odor of new articles and materials at moderate cost and with simple equipment.#

11496

Dmitriev, M. T.; M. A. Pitrovskii, and V. A. Popov

FLAME-IONIZATION CHROMATOGRAPHY FOR DETERMINATION OF ORGANIC MATTER IN AIR. [(O termoionizatsionnoy khromatograficheskom vyyavlenii v atmosfernom vozdukhe.)] Gig. Sanit. (English translation of: Gigiena i Sanit.), 33(5-6):350-356, April-June 1968. [(8)] refs.
CFSTI: TT 68-50449/2

Flame-ionization chromatography performed with serially manufactured gas chromatographs is discussed in detail. This method is useful where large ranges of substances manufactured by the chemical industry makes it very difficult to devise and apply specific colorimetric techniques for the determination of organic atmospheric pollutants. A technique for the determination of tetrahydrofuran in air on a chromatograph, according to the standard methods is presented. Flame-ionization chromatography possesses important operational advantages. The normal air components, including water vapor, do not produce background noise, so that all the peaks are formed by organic pollutants. The chromatographs are insensitive to vibrations, temperature variations, changes in air pressure and wind velocity, and are practically free from inertia. Small variations in the flow rates of hydrogen and nitrogen are likewise immaterial. Flame-ionization instruments may be used in mobile units and in expeditions. Flame-ionization chromatography may be recommended as a universal method for the determination of atmospheric pollutants of organic origin.##

11498

Aigina, E. P.; G. A. Lopukhova, and G. S. Shikentullaeva

SPECTROPHOTOMETRIC DETERMINATION OF THIOPHENE IN AIR. [(Opredelenie tiofena v vozdukhe spektrofotometricheskim metodom.)] Gig. Sanit. (English translation of: Gigiena i Sanit.), 33(5-6):409-411, April-June 1968. [(1)] refs.
CFSTI: TT 68-50449/2

The spectral characteristic of thiophene in the wavelength range 220 - 250 millimicrons, using ethanol, methanol, heptane, hexane and octane as the solvents was studied. Measurements of the optical densities of methanol solutions of thiophene with concentrations up to 15 micrograms/ml at lambda = 231 millimicrons showed these solutions to obey the Lambert-Beer law. Therefore the concentration of thiophene in the solution can be determined from the optical density using a calibration graph, or calculating from an equation. For determinations of thiophene in air in the presence of benzene, another variant was elaborated making use of Vierordt's method. This method makes it possible to determine concentrations of each of the components of a binary mixture from the optical density of solution. The spectral characteristics of methanol solutions of benzene and thiophene are shown. Thus, two variants of the spectrophotometric method are proposed for the determination of thiophene in air. The first variant, proposed for hygienic experiments, is based on measuring the absorption of UV radiation by the methanol solution of thiophene at lambda = 231 millimicrons. Its sensitivity is 0.5 micrograms per 1 ml solution. Benzene in concentrations of up to 20 micrograms/ml does not interfere with the determination. The second variant, proposed for determination of thiophene in air in the presence of benzene, is based on measurements of absorption of UV radiation by a thiophene -- benzene mixture in methanol at 231 and 254.5 millimicrons. The thiophene concentration in the solution is calculated from an equation. This variant is used in the presence of benzene concentrations exceeding 20 micrograms in 1 ml methanol.

11560

Welch, B. A.

A METHOD FOR DETECTING LOW CONCENTRATIONS OF AIRBORNE GASEOUS CONTAMINANTS. Western Electric Co., Reading, Pa.; p. 219-229, illus. [1960(?)].
CFSTI: PB0-20343

A condensation nuclei counter, with suitable converters, may be used to monitor concentrations of sulfur dioxide and certain hydrocarbons. Problems encountered and items of value discovered in using this equipment are discussed. The counter is not actually a counter, but a photometer which measures the forward scattered light in a dark-field optical system. The instrument is unique because it enables monitoring of particles in the submicroscopic range of 0.001 micron to 0.1 micron. The intensity of the scattered light is read by a photomultiplier tube. The meter is divided into linear steps of 100, 1,000, 3,000, 10,000 and 100,000 nuclei per cc exponential steps of 1,000,000 and 10,000,000 and, thereby permitting a response time of only two seconds from intake to readout of a sample. The nuclei counter and sulfur dioxide converter are extremely useful for detecting minute quantities of sulfur dioxide in the ambient air. They are sensitive and reliable, as can be verified by our two years of almost constant monitoring. The value as a quantitative instrument is limited because of a lack of ease in checking operation and the narrow range of contamination measured on the linear scales and the limitations of readout and sensitivity on the exponential portion. The simplicity of operation far outweighs the faults of readout in the investigative area.GS

11954

Brioteux, J.; M. Fassotte, and P. Ledent

A METHOD FOR SAMPLING AND DETERMINING HEAVY HYDROCARBONS IN COMBUSTION FUMES. (Mise au point d'une methode de prelevement et de dosage des hydrocarbures lourds dans les fumees de combustion.) Text in French. Ann. Mines Belg. n(3):309-331, March, 1955. 18 refs.

A method has been devised for sampling and measuring heavy hydrocarbons in combustion smokes. The sampling technique is based on the absorption of the hydrocarbons on a short absorbent column placed within the chimney itself. The smokes can be drawn up through the sampling tube in less than one minute with the help of a rubber syringe. In order to measure the hydrocarbons collected, the sampling tube is inserted in a carrier gas circuit which also includes a flame ionization detector. The tube is brought up to a high temperature in a mobile oven. The hydrocarbons are desorbed and carried by the carrier gas towards the detector; there is no separation of the hydrocarbons and the response appears in the form of a single peak on the recording paper. It is possible to desorb hydrocarbons having a boiling point above 500 degrees C without inducing cracking phenomena. The output, which depends on the boiling temperatures of the sampled hydrocarbons, is excellent and can be still further improved if, prior to the sampling, the tube is refrigerated. A quantity of 10-6g anthracene produces a peak allowing accurate quantitative determination of the compound. The method also makes possible to perform a detailed analysis of the sample and determine the individual concentrations of the various components. For this purpose, a chromatographic column must be inserted into the carrier gas, between the sampling tube and the detector. Several examples of the determination of total and individual concentrations in various synthetic gas mixtures, combustion smokes, cigarette smoke, automobile exhaust, are presented. The possibility of applying the method to the measurement of benzo(a)pyrene is being considered. Another method for assaying the sample by methanol elution followed by a spectrophotometric examination is also described.##

11956

Delaunois, C.

ANALYSIS OF SMALL GAS SAMPLES BY MEANS OF GAS CHROMATOGRAPHY. (Analyse par chromatographie en phase gazeuse, de faibles volumes de gaz.) Text in French. Ann. Mines Belg. n(5):1009-1048, 1956. 7 refs.

In various fields of research, it frequently occurs that quantitative analyses of gas cannot be made by chromatography if the gas is present in small quantities, as the standard methods of injection cannot be used. This problem was solved during research concerning the cracking of phenols in a micro-autoclave, when less than one milliliter of gas is produced. A gas-dosage device, under mercury, was devised, whereby the volume of gas could be measured under atmospheric pressure. An original system for the circulation of mercury, and a method for analyzing H2, CO4, N2, CO2, C2H6, C3H8, on a column of activated charcoal kept permanently at a temperature of 100 degrees C, were developed.##

11559

Delaunois, C. and B. Bottens

ANALYSIS BY GAS CHROMATOGRAPHY OF PHENOLIC AND AROMATIC COMPOUNDS OBTAINED FROM THERMAL CRACKING OF PHENOLS. (Analyse par chromatographie gazeuse des constituants phenoliques et aromatiques issus du craquage thermique des phenols.) Text in French. Ann. Mines Belg., 8(5):631-641, May 1958. 7 refs.

A capillary column of 100 m loaded with propylene glycol was used to separate thirty-six components obtained during the thermal cracking of phenols. In addition to the separation of several aromatic hydrocarbons, it was possible, following previous etherification with hexamethyl disilazane, to separate the isomers of cresols and xylenols. A flame ionization detector was used to determine quantitatively the various components studied to approx. 0.1% in weight. The use of a Perkin Elmer D 25 integrator, contributed greatly to the reproducibility of the results, and reduced the time of analysis.##

11567

Hood, L. V. S., and J. D. Winefordner

THIN-LAYER SEPARATION AND LOW-TEMPERATURE LUMINESCENCE MEASUREMENT OF NITROGEN OF CARCINOGENS. Text in English. Anal. Chim. Acta, 32(2):109-205, Aug. 1965. 15 refs.

Low-temperature fluorescence and phosphorescence characteristics of a number of polynuclear aromatic hydrocarbons are reported. Complex mixtures of hydrocarbons were studied to determine the selectivity of low-temperature luminescence measurement. Low-temperature fluorimetry is applied to measure several hydrocarbon carcinogens after ethanolic extraction from thin-layer chromatograms. The method described permits determination of 0.1 microgram of most of the potent carcinogens (such as pyrene, anthracene, perylene, triphenylene, etc.). The results suggest that the method may be well suited for environmental studies of hydrocarbon pollution.##

11579

Lehmann, Erdwin

STUDIES ON AIR POLLUTANTS. I. ANALYTICAL METHODS. (Die Untersuchung von Luftverunreinigungen. I. Analysenmethoden.) Text in German. Bundesgesundheitsblatt, (10):145-150, May 13, 1967. 71 refs.

This detailed review of the apparatus and techniques used for air pollution measurements deals with both sampling and analytical methods. A distinction is made between sampling or discontinuous and continuous methods of sampling and it is pointed out that only the latter can yield readily interpretable results. In connection with gas sampling techniques, the value of an impinger for increasing the rate of dissolution of gaseous pollutants is discussed. Methods are then described for the quantitative

determination of SO_2, SO_3, NO_2, NO, CO, H_2S, NH_3, and NH_3, and brief mention is made of the techniques of gas chromatography and flame ionization detection for traces of organic compounds. The two principal techniques for estimating the total particulate content of the air are dust-fall and dust-concentration determinations. The latter which depends on photoelectric measurement of the particle density after filtration is more difficult to perform, but more interesting from the health point of view.##

12001

Jacobs, M. B.

GAS CHROMATOGRAPHIC DETERMINATION OF HYDROCARBONS IN AUTOMOBILE EXHAUST. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N.Y., Group on Composition of Exhaust Gas, CRC-AW-506, pp. 36-38, Sept. 21-22, 1955.

The principle proposed for gas chromatographic determination of hydrocarbons in automobile exhaust and gasoline is based on the use of a wide range temperature program with an open tubular column and a flame ionization detector. Automatic integration of the flame detector signal provides peak area values for determining the concentration of each component. All exhaust gas samples for gas chromatographic analysis are collected in 3 cubic foot coated Mylar plastic bags. The hydrocarbon concentration of exhaust samples decreased 3-5% after standing for one hour in these bags. Typically, gas chromatographic analysis showed that the decrease was due primarily to the loss of the more reactive components. The use of the 0.01 in 1D columns provides the separation and determination for as little as 1 ppm mole carbon of each component from C1 through C10 within 15 minutes. At present, an 0.02 in. 1D open tubular column is being used to provide analysis for as little as 0.1 ppm carbon for each component. The conditions for use of the 0.02 in. 1D column are the same as for the 0.01 in. 1D column except for the final column temperature. The separation of hydrocarbons on the larger bore column is quite adequate for quantitative as well as qualitative analysis. The C1 and C2 hydrocarbons are determined on a short packed column of silica gel with a flame ionization unit. The chromatographic conditions are given. An average exhaust chromatogram contains 80-100 measurable peaks while a fuel chromatogram may contain 130-160 measurable peaks. At present, all components are identified by comparison to retention times obtained with standards. This technique was found to yield fast and efficient information for the individual hydrocarbon components found in exhaust and gasoline. Determination of the individual components allows application of specific reactivity factors to the individual components, so that a smog potential for fuel as well as exhaust may be ascertained.##

12002

Harkins, John

PHOTOCOULOMETRIC OLEFIN ANALYSIS. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research

Council, Inc., New York, N. Y., Group on Composition of Exhaust Gases, CRC-HD-604, pp. 41-43, Sept. 21-22, 1965.

The bromocoulometric method is based on the observation that olefins, excluding ethylene, can be quantitatively brominated by passing a gas sample through a solution of appropriate composition. Briefly, the sample is passed through the sensing solution and the time to generate the bromine absorbed by the sample is measured amperometrically, that is, by noting the current flowing through the solution when a constant potential of 220 or 230 mv is applied to the electrodes. With the exception of ethylene the bromocoulometric method appears to do an excellent job in measuring olefins in exhaust gases. Work completed several years ago indicated that ethylene could be obtained by changing the solvent in the cell.##

12072

Gruptnshi, Laonkar/

MEASURING THE CONCENTRATIONS OF ORGANIC SUBSTANCES IN WASTE GASES BY ABSORPTION AND INFRARED SPECTROSCOPY. Staub (English translation), 28(8):28030, Aug. 1968. 4 refs.
CPSTI: 68-60548/8

A method is described for determination of organic substances in waste gases. 10 liters of waste gas, passed through three gas bottles connected in series, are sufficient for detecting 2 mg of organic substances in 1 cu m of waste gas by means of an infrared spectroscope. Perchlorethylene is suitable to be used as the absorbent. The efficiency of washing may be determined with sufficient accuracy by separate determinations carried out in the three gas washing bottles. The method permits direct samples to be taken from waste gas lines at intervals of 10 - 15 minutes. (Author's summary, modified)##

12088

Chakrabarty, R. B. and R. Long

THE FORMATION OF SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS IN DIFFUSION FLAMES. PART THREE. EFFECT OF ADDITIONS OF OLEFINS TO ETHYLENE AND BUTANE RESPECTIVELY AS FUELS. Combustion Flame, 12(5):469-476, Oct. 1968. 15 refs.

The amounts of chloroform-soluble material, polycyclic aromatic hydrocarbons (PCAH), and carbonaceous residue in the dry soot recovered from ethylene-air and ethane-air diffusion flames, respectively, have been determined and the effects on these of increasing additions of oxygen to the fuel have been investigated. With ethylene, the amounts of dry soot, chloroform-soluble material, PCAH and carbonaceous residue (CR) all increase to maxima and then decrease. With ethane, the amounts of dry soot and CR increase to maxima and then decline whereas the chloroform-soluble material and PCAH decrease steadily with increase in oxygen/ethane molar ratio in the fuel stream. The PCAH adsorbed on the soot particles leaving the flame have been analyzed by programmed temperature gas chromatography. Pyrene predominates in the mixture but the carcinogen 3,4-benzopyrene is

present in smaller amounts. Increasing the addition of oxygen to the fuel stream is shown to lead to higher temperatures in the pyrolysis zone and an attempt has been made to account qualitatively for the above results on the basis of the effects on pyrolysis of the fuel and on the oxidation of the products leaving the tip of a diffusion flame. A "qualitative model" for the formation of PCAH and "carbon" has been proposed tentatively on the basis of recent results from this laboratory and elsewhere. (Author's Abstract)##

12563

H. G. McTaggart, C. A. Miller, B. Pearce

QUANTITATIVE HYDROCARBON GAS ANALYSES USING ALUMINA-PACKED GLASS CAPILLARY COLUMNS. J. Inst. Petrol., 54(538):265-277, Oct. 1968. 11 refs.

The experimental conditions necessary to obtain quantitative hydrocarbon gas analysis by gas chromatography using alumina-packed glass capillary columns (0.01 inch id) and flame ionization detection are described. These conditions include the method of reducing the activity of the alumina and the procedure for maintaining a high and constant column performance. The deviation of detector response from true weight proportionality and the need to apply determined correction factors are shown. The quantitative results of a number of analyses of blends of saturated and unsaturated hydrocarbon gases are presented and statistically assessed repeatability figures are given. Analysis times are about a half of that required when using the conventional (1/16 inch id) columns. Inert gas gases, if present, must, however, be determined by other means. Chromatograms are shown to illustrate the application of these columns to the quantitative analysis of saturated and unsaturated hydrocarbon refinery gas streams, and also to natural gas samples. (Author's Summary)##

12579

Bowen, H. H. and P. A. Drayson

STUDY OF AIR QUALITY AND CONTAMINANT ANALYSIS FOR WORK UNDER COMPRESSED AIR. Am. Ind. Hyg. Assoc. J.; 29(5):432-438, Sept.-Oct. 1968. 6 refs.

The quality of air in a tunnel being constructed under pressures varying from 0 to 30 psig was monitored for a period of 24 months. Except for an electrical fire and an oxygen deficiency incident, the tunneling was completed without hazardous levels of air contaminants being encountered. The compressor facilities and sampling and analytical procedures are described. (Authors' abstract)##

12668

R. V. Feeney

A DUAL-COLUMN GAS CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF LIGHT GASES. J. Gas Chromatog., 6(11):555-558, Nov. 1968

Although many separation methods for H2, N2, O2, CO2, CO, CH4, C2H6, and H2O mixtures using gas chromatography have been described in the literature, all have had certain limitations. A system which combines a molecular sieve and a polyaromatic polymer-bead column has the advantage of eluting O2 before N2 and resolving CO2 and H2O, all at ambient or higher temperatures. The column temperature was programmed at 12 degrees C/min. from 30 degrees to 150 degrees C after the CO emerged from the molecular sieve column to speed the elution of water and higher molecular weight hydrocarbons from the polyaromatic polymer-bead column. Higher molecular weight hydrocarbons, amines, chlorinated and nitrated hydrocarbons may be analyzed by this method because the column can be programmed as high in temperature as 200 degrees C to speed the elution of these compounds.##

19887

Ludwig, C. B., B. Bartle, and R. Griggs

STUDY OF AIR POLLUTANT DETECTION BY REMOTE SENSORS. General Dynamics Corp., San Diego, Calif., [132]p., July 1969. 134 refs.

The feasibility of detecting the major air pollutants by earth-oriented, satellite-borne sensors is investigated. The major pollutants considered are carbon monoxide, sulfur dioxide, ozone, aerosols, nitrogen dioxide, typical hydrocarbons, and peroxyacetyl nitrate (PAN). The spectral region considered extends from the ultraviolet to the microwave region. Considerations of the number of species accessible to optical detection, the matter of day and night detection, and of specificity indicate that the infrared region extending from 2.5 microns to 15 microns is the most useful one. A discussion of the pollutant species, their occurrence, formation, chemistry, concentration levels, and distribution profiles through the atmosphere is given. The problems of detection in the UV and visible regions, in relation to aerosol and molecular scattering, are discussed. Calculations of signal changes expected for an ideal Rayleigh atmosphere are presented. Some considerations of aerosol (particulate) pollution detection are discussed. Then, the radiative transfer of the thermal emission of the earth and atmosphere under the influence of meteorological conditions is investigated. Signal changes arising from the difference in radiation levels due to clean and polluted atmospheres are calculated and found to be usually more than 1%. A performance evaluation of eight different spectroscopic instruments for the remote detection of pollutants is made. These include radiometers, grating spectrometers, Fourier-transform interferometer-spectrometers, three instruments based on optical correlation methods, microwave radiometers, and one active system--a satellite-based laser. Two instruments, which are based on optical correlation methods (notched filter and selective chopper), have the greatest potential for near-future application. (Authors' abstract modified)

19828

Bernert, Jurgen

A METHOD FOR DETERMINATION OF THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES WITH HIGH WATER VAPOR

CONTENT: (Neue Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen mit hohen Wasserdampfgehalten). Text in German. Wasser Luft Betrieb, 13(6):315-316, June 1969. 5 refs.

The method for determination of the total amount of combustible organic substances in waste gases described in two previous papers by J. Bernert and F. Engelhardt becomes inaccurate in cases when the waste gases have a high moisture content or are even saturated with water vapor. This drawback is corrected by a new sampling aspirator in which the waste-gas sample is cooled to remove the moisture by condensation. In this manner, the sample is separated into an aqueous phase and a gaseous phase. The determination of the total C concentration in the latter can now be carried out with high precision by the original method, while the composition of the condensate can be determined in several different ways. The method of Egli-Shaz, which involves the determination of dissolved organically bound carbon in waste water, is believed to be best suited
for this type of investigation.

13050

Dudeck, Paul R.

SAFETY AND VENTILATION. Mining Engineering, 21(2):110-111, Feb. 1969.

Coal mine gas explosions may be due to an accumulation of undetected methane, a flammable gaseous hydrocarbon. A new methane monitoring system is being developed and tested by industrial and government agencies. This system is designed as an integral part of permissible face equipment and would automatically cut off power to the mining machines when the percentage of methane reached a concentration of 2% or more for a period of 1 sec. The monitor's electrical system is completely isolated from the mine's power circuit, and the warning lights of the monitor are visible to everyone in the vicinity of the unit. The monitor offers greater protection from methane gas liberated from the coal seam.

13156

Yoda, Osamu

ON THE METHODS OF EVALUATING THE EXPOSURE TO TOXIC SUBSTANCES BY ANALYZING THE METABOLITES IN THE BODY. [Rinsho toseki genshutsu ni yoru yusoshutsu bakuro hyoshoki]. Text in Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo), 45(3):171-181, 1969. 177 refs.

Under certain conditions, the amount of toxic substance absorbed by workers exposed to toxic air contaminants cannot be predicted from air analysis data. If the concentration of metabolites in tissue or excreta is proportional to that of the toxic substance in the air, the degree of adverse exposure may be evaluated by analyzing samples of expired air, blood, urine, or hair, with reference to atmospheric thresholds limit values. Tests for measuring the level of exposure to carbon monoxide, aromatic vapor, inorganic lead, and chlorinated hydrocarbon, are

discusses the various methods developed for determining the carboxyhemoglobin level in the blood of workers exposed to carbon monoxide, the 20-second breath holding method is the most practical and convenient. If the determination is carefully made, the urinary excretion of mercury can be used as an indicator of exposure to mercuric vapor. The absorption of lead varies according to whether it is absorbed as fume or dust. Therefore, the degree of exposure should be evaluated by analyses of lead in urine or blood during repeated exposure. The storage of lead in the body can be determined by the increase in urinary excretion of lead following the administration of calcium ethylenediaminetetraacetate. The determination of urinary excretion of alkaline-pyridine reactants is tentatively suggested as an indicator of exposure to chlorinated hydrocarbons. (Author abstract modified)

19561

Brunauer, Stephen and Paul H. Emmett

THE USE OF LOW TEMPERATURE VAN DER WAALS ADSORPTION ISOTHERMS IN DETERMINING THE SURFACE AREAS OF VARIOUS ADSORBENTS. J. Am. Chem. Soc., Vol. 59, p. 2682-2689, Dec. 1937. 12 refs.

Low temperature van der Waals adsorption isotherms of various gases have been determined on a variety of adsorbents. Argon and nitrogen were determined at -195.8 C; argon, nitrogen, carbon monoxide and oxygen at -183 C; carbon dioxide at -78 C; and butane and sulfur dioxide at 0 C. A number of different adsorbents were used, including copper catalysts, nickel, silica gel samples, and activated carbon. All the adsorbents except carbon gave S-shaped isotherms. The values for the surface area evaluated from the different isotherms for the same adsorbent were consistent with each other.

19779

Thompson, C. J., H. J. Coleman, C. C. Ward, and H. T. Hall

DESULFURIZATION AS METHOD OF IDENTIFYING SULFUR COMPOUNDS. Anal. Chem., 32(3):326-330, March 1960. 11 refs.

A desulfurization technique is described for pure sulfur compounds and gas-liquid chromatograph fractions of less than 0.0002 ml of sulfur compound concentrations from crude oils. The apparatus consists of an alundum reaction tube packed with catalyst, a furnace for heating the reaction tube to the desired temperature, a motor-driven syringe for charging relatively large quantities of pure compounds, and the necessary adapters, valves, and connectors for handling very small trapped samples from the GLC column. Samples are passed through the apparatus at a temperature of 150 to 300 C, and the hydrocarbons produced upon desulfurization are collected and identified by gas-liquid chromatography. By analyzing the hydrocarbons produced, it is possible to deduce also the exact sulfur compounds found in the crude oil fractions. Data are presented showing the desulfurization of typical members of the sulfur compound classes: alkane and cycloalkane thiols, alkane and cyclic sulfides, thiophenes, and benzothiophenes.

13805

Chaigneau, M., L. Gary, and L. P. Rivard

ANALYTICAL INVESTIGATION OF SOME TYPES OF SOOT, USING MASS SPECTROMETRY. [Etude analytique de quelques suies par spectrometrie de masse]. Text in French. Chim. Anal. (Paris), 51(6):387-395, April 1969. 9 refs.

Application of mass spectrometry to soot obtained from the combustion of fuel in a boiler furnace, from the combustion of motor fuel, and from chimney deposits caused by the burning of firewood revealed that carbonaceous deposits comprise complex mixtures containing numerous organic substances. Of the 79 organic bodies identified, 38 were hydrocarbons and these included a number of condensed-nucleus polycyclic compounds and aromatic hydrocarbons. Among the main compounds were derivatives of naphthalene, pyrene, perylene, acenaphthalene, and diphenyl. Other compounds identified were acridines, phenols, and quinones. The data obtained show that the composition of soot varies according to the origin of the fuel and the method of combustion. Soot from wood contains more hydrocarbons than soot from fuel oils or even motor fuels, but soot from fuel oil contains only hydrocarbons. Quinones, phenols and their ethers, acetic acid, and benzaldehyde are found only in soot from wood.

13976

Reuss, H.

DETERMINATION OF HYDROCARBON CONTENT OF THE AIR BY GAS CHROMATOGRAPHY. [Bestimmung des Kohlenwasserstoffgehaltes der Luft mit Hilfe der Gaschromatographie]. Text in German. B. Motorrad., 20(1-6):60-67, 1968. 9 refs.

A flame ionization detector installed at the outlet of an appropriate gas chromatographic column permits direct measurements for quantitative and qualitative analysis of atmospheric hydrocarbons up to 0.1 ppm. Traces two orders of magnitude smaller must be analyzed in concentrated form. The physical-chemical fundamentals of gas chromatography are briefly summarized, as is the function of the detector. An experimental apparatus which shows the stated sensitivities is described. (Author abstract modified)

13989

Obiasander, R. and D. Kraeft

DETOXICATION OF AUTOMOTIVE EXHAUST GASES - MEASURING METHODS AND TEST CYCLES. [Abgasentgiftung an Kraftfahrzeugen - Messverfahren und Testzyklen]. Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 71(4):117-124, 1969. 24 refs.

detoxification of automotive exhaust gases raises not only motor engineering problems but also measurement engineering problems. The various methods for measurement of CO based on heat conductivity, on heat evolution and on infrared absorption are discussed and compared. The disadvantages of hydrocarbon measurements in the hexane range and of the flame ionization method are pointed out. Also discussed are the measurement of nitric oxide and the existing and planned multi-stage test cycles. A brief discussion of the possibilities of lowering the exhaust gas emission by motor modifications, the effects of traffic, and the fuel composition is included.

14109

Leonardos, Gregory, David A. Kendall, and Nancy J. Barnard

ODOR THRESHOLD DETERMINATIONS OF 53 ODORANT CHEMICALS. Preprint, Air Pollution Control Assoc., Pittsburgh, 21p., 1968. 4 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Assoc., St. Paul, Minn., June 23-27, 1968. Paper 68-13.)

Recognition odor thresholds for 53 commercially important chemicals were determined in the laboratory by an expert panel of four members. By standardizing the method of sample presentation and minimizing extraneous sensory interference, the concentrations determined as producing the minimum identifiable odor response provided consistent and internally comparable data for one parameter of odor. The odorants were presented to the panel in a static air system utilizing a low-odor background air as the dilution medium. The odor threshold was defined as the first concentration at which all panel members were able to recognize the odor. Aspects of human odor detection and of the concept of the odor threshold are discussed. The thresholds determined for each odorant in terms of parts per million by volume are presented. The minimum threshold observed was with trimethyl amine at 0.00021 ppm. As a group, compounds with sulfur had the lowest thresholds of the compounds tested. It was noted that carbon disulfide, sulfur dichloride, and sulfur dioxide affect the other chemical senses (taste and feel) as well. The presence of unsaturation in an odorant chemical was not found to be associated with low threshold concentrations, and it is observed that extended generalizations pertaining to the odor threshold based on similar chemical structures cannot easily be made. With reference to benzenoid-type materials, substitution on the benzene ring reduced the odor threshold by as much as a thousandfold depending on the nature of the group added, and in general produced a wide variation in thresholds. Three chemicals, toluene, styrene, and tolylene diisocyanate were purified by a gas-liquid chromatography to note the effect of chemical purity on the odor threshold; differences from threshold determined from starting materials seemed slight, if any.

14125

Matsushita, Hidetsuru, Yasutomo Suzuki, and Hiroyuki Sakabe

A SPECTROFLUOROMETRICAL METHOD FOR DETERMINATION OF 3,4-BENZPYRENE IN BENZENE SOLUTION CONTAMINATED WITH 1,2-

BENZFLUORANTHENES OR 3,4-BENZFLUORANTHENE AND 1,2-BENZPYRENE. Ind. Health, (Japan), Vol. 3:109-120, 1965. 11 refs.

A spectrofluorometric method is proposed which consists of removing oxygen dissolved in a test solution, measurement of fluorescence, and determination by a narrow base line method as outlined by Cossins. By this method, 3,4-benzopyrene can be determined accurately even in a solution containing 3,4-benzopyrene, 3,4-benzofluoranthene and 1,2-benzopyrene in a concentration ratio of 1:100:100. This method has an advantage over the ordinary peak method in that it eliminates interference of the contaminants which may be attributed to the following facts. Fluorescence intensities of the contaminants change in an approximately linear manner over the narrow range of wavelength near 405 millimicrons and removing the oxygen makes the characteristic peak of 3,4-benzopyrene distinct at 405 millimicrons. However, the narrowing of wavelength range has some limit, as it results in a decrease in peak height and drop in sensitivity. The base line which connects the two points 25-30A distant from the 405 millimicron peak on either side is assumed to be most suitable for the determination of 3,4-benzopyrene in the benzene solutions contaminated with impurities. Selection of a excitation source seems to be an important factor to minimize interference of contaminants, although in this case only 365 millimicron mercury light was used. If the exciting light is so selected that it is absorbed strongly by 3,4-benzopyrene and weakly by contaminants, the present method will be also useful for the determination of 3,4-benzopyrene in a solution contaminated with various other polynuclear hydrocarbons.

18173

Sharkey, A. G., Jr., J. L. Shultz, T. Kessler, and R. A. Friedel

DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER. Res./Dev., 20(9):30-32, Sept. 1969. 14 refs.

In this limited investigation of organic contaminants in airborne particulate matter and treated sewage, the potential of the high-resolution mass spectrometer for expanding the knowledge of pollutants in air and water supplies is demonstrated. A major advantage of this type of instrumentation is that the elemental compositions of a wide variety of components can be determined on essentially total samples. Information concerning alkyl derivatives, such as carbon number distribution data obtainable by mass spectrometry, could be of prime importance in studies of carcinogenic pollutants. A limitation is that particular isomers cannot be determined. Combined gas chromatographic-mass spectrometric techniques, particularly with the use of high-resolution mass spectrometry in this combination, will increase the usefulness of the method for studies of organic pollutants. Data are presented on ten typical airborne pollutants to illustrate the applicability of the high-resolution technique to detect and determine the elemental composition of polynuclear species in atmospheric particulate matter. Additional data are given to illustrate the ability of the instrument to detect organic compounds having the same nominal molecular weight but different precise mass resulting from the presence of heteroatoms. (Author conclusions modified)

14301

Bellieve, Lawrence

GAS CHROMATOGRAPHIC ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SOOT SAMPLES. Environ. Sci. Technol., 3(10): 968, Oct. 1969. 3 refs.

An unknown pyrene derivative was isolated from soot by Long and Chakrabarty in 1967. An apparently identical compound isolated by this author from a coal tar pitch is presumed to be cyclopenta(e,f)pyrene (or acepyrene). The absorption spectrum of this substance has the seemingly characteristic peaks found by Long and Chakrabarty at 278 and 288 millimicrons. Its molecular weight is 226, and its mass spectrum possesses peaks at m/e values greater than 226. Cyclopenta(e,f)pyrene is the only compound of reasonable structure that can have a molecular weight of 226 as well as the absorption spectrum and chromatographic behavior of an alkyl pyrene derivative. It is by no means a trace element. Five to 10 micrograms were isolated from 5 mg of coal tar pitch, indicating a concentration of 0.1%.

14429

Nadaiia, Olga

APPROPRIATE IN MICROANALYSIS. IV. ADSORPTION PROPERTIES OF SILICA GEL IN SIMULTANEOUS DETERMINATION OF CARBON, HYDROGEN, AND HALOGEN OR CARBON, HYDROGEN AND SULPHUR. Mikrochim. Acta (Vienna), no. 5:1113-1116, 1969. 2 refs.

A simple gravimetric method is described for simultaneous microanalytical determination of carbon and hydrogen together with sulfur, bromine, or iodine, in non-nitrogenous compounds. Commercial silica gel is used as the external absorbent for sulfur dioxide and halogens at room temperature. Under these conditions, sulfur dioxide does not oxidize to sulfur trioxide. The increase in weight of the silica gel tube corresponds to sulfur dioxide formed from which the percentage of sulfur can be calculated. One silica gel layer can be used for 4-5 analyses, provided that the first analysis is that of a sulfur-containing compound. The method does not work for nitrogen-containing compounds.

14430

Hanus, Milos, Milada Holechova, Jiri Holecha, and Jaroslav Hyslivecek

ANALYSIS OF GASEOUS MIXTURES CONTAINING CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN, METHANE, NITROGEN AND OXYGEN. [Czech] Metody analyticke uhelnatoho, kyslicniku uhliciteho, vodiku, methanu, dusiku a kyslicku plynovou chromatografii. Text in Czech. Chem. listy, 63(6):703-709, 1969. 11 refs.

The title compounds are found in combustion products, in chemical plants, and in all cases where the burning of fuel is not fully

accomplished. The use of gas chromatography for measurement gives more precise and rapid results than all other known methods. Analysis of incompletely burned methane uses helium as carrier gas and thermal conductivity and combustion detectors are used for determinations. Gases are separated on a molecular sieve 5A and 8-hydroxyquinoline. Individual gaseous mixtures are recorded at optimal sensitivity, in accordance with possible percentage content of individual components in the sample. From empirical results it is evident that the greatest accuracy is achieved for carbon dioxide and methane and the least for nitrogen.

19870

Steger, Eberhard and Hermann Zahl

THE ANALYSIS OF GASEOUS AIR CONTAMINATIONS BY INFRARED SPECTROSCOPY. (Die ultrarotspektroskopische Analyse gasförmiger Luftverunreinigungen). Text in German. Chem. Tech. (Berlin), 21(8):483-488, Aug. 1969. 43 refs.

The detection thresholds of infrared spectrometry were determined for diethylether, carbon tetrachloride, benzene, acetone, methanol, carbon dioxide, sulfur dioxide, hydrogen sulfide, propane, and acetylene in the gaseous state. The recorded spectra were analyzed by the method of weight. In all analyses of the gases, such influences as pressure and interference by other compounds must be taken into account. It is important to use the same pressure for the measurement and the calibration. Interfering substances, particularly H_2O, were eliminated by use of the drying agent calcium chloride. Study of mutual interference showed that only methanol was slightly influenced by diethylether. The error calculation method for evaluation was used when the average value was determined from at least five measurements. The detection thresholds found for the substances measured are listed. It is concluded that infrared spectrometry can be used for gas analyses in the concentration range of the threshold limit value for eight hours (with the exception of H_2O). It is not good enough, however, for concentrations in the range of maximum allowable values in the atmosphere.

19876

Isfeld, H.

METHOD FOR DETERMINING ORGANIC SUBSTANCES IN WASTE GASES. (Verfahren zur Bestimmung organischer Substanzen in Abgasen). Text in German. Brennstoff-Chem. (Essen), 50(6):186-189, June 1969. 4 refs.

The method of Isfeld and Ruck for quantitative determination of organic substances in waste gases (with the exception of the hydrocarbons C1-C4) can be improved if the samples are carefully taken and prepared. This improvement is illustrated by the example of waste gases from a lacquer-drying stove. The waste gases from these stoves are usually cleaned in catalytic after-burners. The partially clean gases contain much higher fractions of CO_2 (50 to 100 g/cu m) and water vapor (20 to 50 g/cu m) than the uncleaned waste gases. These high concentrations may have a

considerable influence on hydrocarbon analysis by the infrared and Buck method. To determine the magnitude of this influence, CO2 and synthetic air were mixed in a 1:1 ratio and freed of combustible organic substances. The gas mixture, cooled to room temperature and saturated with water vapor, was passed for 10 min through a silica gel tube. The tube was tightly sealed afterwards and left to rest for periods of up to 24 hrs. After that it was flushed for 5 min with nitrogen and desorbed. The desorbed CO2 quantity was proportional to the length of time the silica gel tube rested. The optimum resting period between the two flushings was 4 hrs. After this period, further reduction of the remaining CO2 content was found to be negligible. The nitrogen flushings did not influence analysis of the adsorbed organic substances. Similar experiments were conducted to determine the influence of N2O. So-called 40 silica gel was used as the adsorbent and hexane as the organic component with synthetic air. The measurement errors increased with water content. Lowering of the gas throughput in the case sampling line brought no improvement. Aerosols can be better sampled if glass fiber filters are inserted ahead of the silica gel tube.

18525

Innes, W. B.

SELECTIVE COMBUSTION ANALYSIS AND APPLICATION TO AUTO EXHAUST. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 383-392. 4 refs.

The application of a vanadia catalyst to hydrocarbon analysis is discussed. The combination of hydrocarbon-carbon monoxide analysis involves a second parallel reactor with a Hopcalite catalyst. Air with constant moisture content passes through a temperature-controlled preheater and catalyst bed at a constant flow rate, and the gas sample is added to the air stream in a small quantity. A review of California data indicated that the idle mode was reasonably good for predicting pass/fail hydrocarbon emission levels and that it could be correlated with cycle values on a statistical basis. About 100 cars were tested at local service stations, car washes, and dealerships which were believed to be representative of the Los Angeles basin car population. About 200 cars were also tested in car clinics. The results suggested that over half the emissions can be attributed to the high emitters (greater than 1000 ppm), most of which are believed to have defective ignition systems. The effect of routine tuneup by tuneup specialists on emissions was also studied. The results, in line with other studies, suggest that cars with reasonably low emissions are not helped and emissions may even increase, and that the average degree of improvement from a professional tuneup is proportional to how much the levels exceed that of a car in good shape. Together with the distribution data, they suggest that an effective check and correct program could lower emissions by as much as 50%.

16667

Shair, H., F. G. Pearce, and P. E. Benson

DIESEL ENGINE POLLUTANTS. PART I. IDENTIFICATION. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. Pittsburgh Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 209-230.

High molecular weight organic constituents of diesel exhaust other than unburned diesel fuel have identified. Samples were collected by the use of a thermal gradient trap from a slip stream off the total exhaust effluent. The organic pollutants were partitioned out with n-hexane. A portion of the diesel odor concentrate was subjected to additional separation over silica gel. Identification of the components was made by mass spectrometry. The pollutants were found to be partially oxidized components of the diesel fuel over its full molecular weight range. Five different classes of oxygenated hydrocarbons were found: aldehydes and ketones, carboxylic acids, alcohols, phenols, and nitrophenols. These yielded a total of over 600 observable species. Aldehydes and ketone derivatives of paraffins, cycloparaffins, olefins, and aromatics were observed. In the aromatic series, benzaldehyde, indanone, cinnamaldehyde, indenone, naphthaldehyde, anthraphthenone, and fluorenone and their higher homologues were found. The aromatic carbonyl compounds were the predominant species. The vital role of the aromatic oxygenates in the diesel odor picture was further substantiated by the absence of diesel odor in the exhaust when a fuel consisting of only n-paraffins was used. The precursors of diesel odor are therefore considered to be primarily the aromatics present in diesel fuel. Their observed relative enrichment is reasonable when one considers the relative rates for oxidation of a paraffin versus an aromatic. For aromatics, oxidation to intermediate compounds is faster than for paraffins, and complete oxidation is slower.

16668

Jaeger, J. and O. Lugrova

STANOVENI 3,4-BENZPYRENU VE SMESI POMOCI FLUORESCENCNI SPEKTROGRAFIE ZA TEPLOTY -197 C. [Determination of 3,4-benzpyrene in a mixture by fluorescence spectrography at the temperature -197 C. Stanoveni 3,4-benzpyrenu ve smesi pomoci fluorescencni spektrografie za teploty -197 C]. Text in Czech. Chem. Zvesti, 19(10):774-783, 1965. 18 refs.

Analysis of aromatic polycyclic compounds is made possible using fluorescence spectrography at very low temperatures. Suitable solvents are chosen from the normal paraffin series. Under this condition, the spectrum has very sharp peaks, comparable to atomic absorption spectra. The presence of the substances can be detected even if they exist as traces in concentrations of 10 to the minus 11th power to 10 to the minus 9th power g/ml. 3,4-Benzpyrene gives a sharp maximum at 4010 A at a concentration of 10 to the minus 11th power in 1 ml of octane. The test is carried out on a thin sheet of alumina

oxide. A standard solution of pure 3,4-benzpyrene is added to the specimen so that after the dilution, the limit of 0.15 microgrammes/m3 is not exceeded. To keep error lower than 5%, absorption of the solution should never be higher than 0.017 for 1 cc of solution at 3650 A. The other sources of measurement error are high concentration, unsteady current in the source of radiation, error in drawing the dilution, and error of dilution.

14663

Dikun, P. P.

DETECTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN POLLUTED ATMOSPHERES AND OF OTHER POLLUTANTS BY MEANS OF QUASILINEAR FLUORESCENCE SPECTRA. (Obnaruzheniye politsiklicheskikh aromaticheskikh uglevodorodov v zagryaznennykh atmosferakh vodoyema i drugikh ob'yektakh s pomoshch'yu kvazilinejchatykh spektrov flyuorestsentsii). Text in Russian. Sb. Prikl. spektrosk., 6(3):293-299, Feb. 1967. 19 refs.

Contaminants present in urban atmospheres were investigated by column and thin-layer chromatography and by spectral analysis of quasilinear fluorescence spectra. Nine substances, including three compounds possessing very high carcinogenic activity, were detected in contaminated atmospheres. Polycyclic aromatic hydrocarbon data obtained from the present investigation were compared with earlier data. Structural formulas of the compounds found in the polluted atmosphere are given. Tables give numerical information extrapolated from data obtained by means of fluorescence spectroscopy.

14788

STUDY OF THE CONTINUOUS DETERMINATION OF ORGANIC SUBSTANCES WITH FLAME IONIZATION DETECTORS. (Beitrag zur kontinuierlichen Summenbestimmung organischer Substanzen mit Flammenionisationsdetektoren). Text in German. Staub Luft Reinh., 13(3):68-69, 1963. 8 refs.

Two hydrocarbon analyzers were used for continuous determination of gaseous organic substances in the air. They were set up in a busy street of Berlin and calibrated with 5.6 and 16.5 ppm methane in synthetic air. The recordings were evaluated by planimetry and half-hourly averages were computed. From these, the daily averages were computed for a total of 30 measurement days. From the daily averages for a concentration range of 2.0 to 7.1 ppm methane, a standard deviation of 0.46 ppm was obtained. The results showed that the flame ionization detector can be used for such measurements if it is carefully calibrated and serviced.

14773

Starshov, I. N. and G. Ya. Ivanova

DETECTION OF TRACE QUANTITIES OF DICHLOROETHANE IN AIR. (Opredeleniye nebol'shikh kolichestv dikhloretana v vozdukhe). Text

in Russian. Gigiena i Sanit., no. 7:58-65, 1969. 8 refs.

Chromatographic detection of dichloromethane using a DIP-1 chromatograph is described. Analysis takes four minutes and is sensitive to a concentration of 0.005 g dichloromethane per liter of air. This equipment is suitable for single determination or for continuous monitoring. Preparation and calibration of the column is described.

18819

Freedman, R. W., H. W. Lang, and R. Jacobson

GAS CHROMATOGRAPHIC ANALYSIS OF THE PRINCIPAL CONSTITUENTS OF MINE ATMOSPHERES. Bureau of Mines, Washington, D. C., RI 7100, 11p. [apr], 1968. 7 refs.
(Part1, PB 1a7 375

A gas chromatographic method for the rapid and accurate determination of oxygen, nitrogen, carbon dioxide, and if present, carbon monoxide, in mine air was developed. This method replaces presently used gas-reaction types such as the Haldane or Orsat analysis, offering advantages of precision, accuracy, speed, and convenience. The gas chromatographic system can detect O_2, N_2, CH_4, and CO_2 in a sample of air in concentrations ranging from 0.01 to 100%. Precision and accuracy are attainable over most of the range with a coefficient of variation of plus or minus 1%. Chromatographic analysis is complete within about 7 minutes of sample injection. If carbon monoxide is present in excess of 0.01%, it can be determined as a peak separating about 3 minutes later. The sample is introduced by a gas sampling valve and is split into two analytical columns. Column 1 separates oxygen, nitrogen, and methane, and, if indicated, carbon monoxide. The methane peak appears in about 3 minutes, and the carbon monoxide peak appears in about 10 minutes. Column 2 effects the separation of carbon dioxide from composite gases in about 2 minutes. Concentrations of the gases are quantitatively determined by comparing the integrated peak areas with the areas of standard gas peaks under similar conditions.

19171

Yasuta, Nobuyu

MANUAL METHODS AND AUTOMATIC CONTINUOUS INSTRUMENTS FOR MEASUREMENT OF HARMFUL AIR POLLUTANTS. (Gaseijo taikai sokuteihoho no mokuteki to sono mokuteihoho). Text in Japanese; Koqai to Taisaku (J. Pollution Control), 5(10):785-798, Oct. 1969. 38 refs.

In order to prevent air pollution, measurement of pollutant concentrations must be continuously performed. In this report, both continuous monitoring and manual analyses of typical air pollutants are reviewed. Numerous methods are tabulated and most of them are explained, with particular attention to continuous methods and apparatus. Sulfides are measured manually by colorimetric analysis with rosaniline or barium molybdate, by the

lead peroxide method, or by tape paper methods. Sulfides are also measured continuously by means of solution conductance (Thomas automator) or by optical absorption with rosaniline or with iodine-starch. Carbon monoxide is measured manually with palladium sulfate and ammonium molybdate, by gas chromatography, or by the hopcalite method. It is measured continuously by infrared or ultraviolet absorption of reduced mercuric oxide. Nitrides are measured manually by the Saltzman or the Jacobs method, or with ortho-tolidine nitrate. Hydrogen sulfide is measured manually by methylene blue and continuously by a colorimetric filter paper method. Hydrocarbons are measured manually by gas chromatography and continuously by flame ionization detectors. Formaldehyde is measured manually by colorimetric analysis with a chromotropic acid or with acetylacetone, or by the Hantzsch method. Ozone is measured manually by the phenolphthalein or the potassium iodide method and continuously by coulometric titration or by optical absorption with potassium iodide. Fluorides are measured manually by colorimetric analysis with thorium neothron (?) or lanthanum alizarin complex and continuously by filter paper fluorescence. Actual Tokyo data on changes in the concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are tabulated.

19280

Wang, W. H., Jr.

THE CONTINUOUS MEASUREMENT OF HYDROGEN, METHANE, AND HYDROCARBONS IN THE ATMOSPHERE. Preprint, American Chemical Society, Washington, D. C., 20p., 1969. 3 refs. Presented at the American Chemical Society, 158th National Meeting, New York, Sept. 8-12, 1969.

Photochemically inert methane accounts for 90% of atmospheric hydrocarbons, and its large signal interferes with the flame ionization detection of active smog-producing hydrocarbons. To overcome this problem in hydrocarbon monitoring, automatic systems were developed which use a flame ionization detector or water sorption detector in conjunction with a selective catalytic combustor. The programmed combustor unit, consisting of a quartz tube containing a platinum wire coil, takes advantage of methane's inertness to analysis for it in the presence of hydrocarbons. The combustor can be utilized in three ways, each of which was evaluated for several months in the laboratory and in the field. One method involves the selective combustor and a flame ionization detector. An automatic zero level, methane, and total hydrocarbons are recorded by this method. In the second method, hydrocarbons are dried, combusted, and converted to water and carbon dioxide. The water is detected by a sorption detector. Hydrogen, olefins, paraffins, and methane are recorded. The third method is analogous to the second, except that carbon dioxide is determined, rather than water. The second method is preferred since no extra gases are required, calibration is simple, and equipment is portable and battery-operated. With this technique, 1.6 ppm methane, 1.5 ppm paraffins, and 1.9 ppm olefins and other reactive hydrocarbons have been recorded. However, it is expected that air monitoring stations with flame units will prefer the first method. The water sorption technique should gain acceptance if hydrocarbon monitoring becomes important.

15277

Institut National de l'Industrie Charbonnière, Liege, Belgium

DESIGN OF A METHOD OF SAMPLING AND MEASURING HEAVY HYDROCARBON CONCENTRATIONS IN COMBUSTION GASES. [Mise au point d'une methode de prelevement et de dosage des hydrocarbures lourds dans les fumees de combustion]. Text in French. Bull. Tech. Houille et Derivees, no. 36, 19p., March 1958.

A method was devised for sampling and measuring heavy hydrocarbons in combustion gases. The sampling technique is based on the absorption of the hydrocarbons on a short absorbent column placed within the chimney itself. The gases can be drawn up through the sampling tube in less than one minute with the help of a rubber syringe of the 'propipette' type. To ensure the hydrocarbons collected, the sampling tube is inserted in a carrier gas circuit which also includes a flame ionization detector. The tube is brought to a high temperature in a suitable oven. The hydrocarbons are desorbed and carried by the carrier gas towards the detector; there is no separation of the hydrocarbons, and the response appears in the form of a single peak on the recording paper. It is possible to detect hydrocarbons with a boiling point above 500 C, and it has been demonstrated that no cracking occurs. The desorbed output, which depends on the boiling temperatures of the sampled hydrocarbons, is excellent and can be still further improved if, prior to the sampling, the tube is cooled to the temperature of the dry ice. With regard to sensitivity, it was demonstrated that, in the case of anthracene, quantities equal to 0.000001 g produced a peak the area of which allowed a precise measurement to be made. The method also makes it possible to carry out a detailed analysis of the sample and determine the individual concentrations of the various components. For this purpose, a chromatographic column must be inserted into the carrier gas between the sampling tube and the detector. Several examples of the determination of total and individual concentrations are given in various fields: synthetic mixtures, combustion gases, cigarette smoke, and automobile exhaust gas. The possibility of applying the method to the measurement of benzo(a)pyrene is being considered. In addition, a second method of assessing the sample by methanol elution followed by a spectrophotometric examination is described.

15337

Stanley, Thomas W., Myrna J. Morgan, and James E. Hooker

RAPID ESTIMATION OF 7H-DIBENZ(DE)ANTHRACEN-7-ONE AND PHENALEN-1-ONE IN ORGANIC EXTRACTS OF AIRBORNE PARTICULATES FROM 3-HOUR SEQUENTIAL AIR SAMPLES. Environ. Sci. Technol., 3(11):1198-1200, Nov. 1969. 5 refs. [Presented at the Div. of Water, Air, and Waste Chemistry, American Chemical Society, 156th Annual Meeting, Atlantic City, N. J., Sept. 1968.]

Thin-layer chromatography using glass-fiber paper impregnated with silica gel was used to separate 7H-benz(de)anthracen-7-one and phenalen-1-one found in acetone extracts of airborne particulates from 3-hr sequential air samples. Only 15 min was required to separate 0.3-1.25 mg of the crude extract with 10:1 pentane-ether.

direct fluorometric measurement and scanning at λ 313/350 and λ 405/460 indicated concentrations ranging from 2 to 58 nanograms/1000 cu ft of air for 7H-benz[de]anthracen-7-one and from 0.3 to 17 for phenalen-1-one. For 7H-benz[de]anthracen-7-one, the precision of the method calculated as relative standard deviation was approximately 3.2%, with a detection limit at 2 nanograms. For phenalen-1-one, the precision was approximately 7.0%, with a detection limit of 8 nanograms. The method was applied to analysis of 24-hr sequential air samples taken with Hi-Vol samplers over two 24-hr periods during January 1968 in polluted urban atmosphere. In the absence of detailed meteorological and land-use data, no meaningful conclusions can be drawn to explain changes in concentrations of these compounds during the 24-hr periods investigated. At the same site used for this investigation, a different diurnal distribution pattern was observed for four polynuclear aromatic hydrocarbons. However, the distribution patterns were consistent with peak concentrations occurring from 6-9 a.m. and from 3-6 p.m. The direct spectrophotofluorometric procedure reported in this paper and similar procedures show potential for application to more comprehensive air pollution studies.

19358

Wilson, R. W., G. J. Doyle, D. A. Hansen, and R. D. Englert

PHOTOCHEMICAL REACTIVITY OF TRICHLOROETHYLENE AND OTHER SOLVENTS. Am. Chem. Soc. Div. Org. Coatings Plastics Chem. Preprints, 29(2):555-559, 1969. 8 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

A special smog chamber was built to study the slowly reacting solvents which, in the presence of nitrogen oxides, form smog much more slowly than do automobile exhausts. The chamber has Pyrex panels with an access wall of cast aluminum. The aluminum wall incorporates eye ports for measurement of eye irritation, an access hole for the option of a multireflection infrared cell, and sampling ports through which gas is removed for wet chemical analysis. An air purification system for the chamber removes contaminants by catalytic combustion over platinum at 5-8 atm and 500 to 700 C and cools the purified air to below 327 C and about 1 atm. Performance of the chamber was validated by charging it with test hydrocarbons, e.g., ethylene, cyclohexane, trichloroethylene, xylenes, and paraffins at 1, 5, or 8 ppm and nitric oxide at 0.25, 1, or 2 ppm. The photooxidation experiments show that the rate of photochemical smog formation decreases as the hydrocarbon:nitric oxide ratio decreases and that eye irritation is caused primarily by formaldehyde. As judged by the rate of disappearance, trichloroethylene is less reactive than ethylene. Trends observed with changing concentrations of trichloroethylene also suggest that average atmospheric concentrations of trichloroethylene would produce no eye irritation or other measurable smog symptoms.

19355

Luis, P., C. M. Carducci, and A. Sa

DETECTION OF FLUORINE ON THE MARGRAF SCALE; INORGANIC AND ORGANIC

FLUORINE COMPOUNDS. Mikrochim. Acta (Vienna), no. 5:870-881, 1959. 6 refs.

Simple techniques are described for detecting fluorine on the nanogram scale. They are based on the evolution of hydrofluoric acid as revealed by an alizarin-3-methylamine-N,N'-diacetic acid-cerium(III) complex reagent and the use of a Pyrex capillary silicontized to prevent the glass from retaining hydrofluoric acid at ordinary temperatures. The methods are suitable for the detection of fluoride in waters, minerals, salts, and organic compounds including complex pharmaceutical preparations and plastics. Even 150 pg of fluorine can be revealed in a 1:500,000 solution of the reagent.

19488

EXTENDED TESTING OF THE METHANE IONIZATION DETECTOR. (FINAL REPORT). Contract AT(30-1)-2717, Melpar, Inc., Falls Church, Va. Rept. MTO-2717-1, 21p., Dec. 1968.

A sensitive automatic detector was developed for monitoring the building of methane in coal mines and detecting the gas before it reaches the lower explosive limit. The detector uses a cross-section ionization detector as the basic transducer. Each transducer cell contains two foil electrodes and each electrode contains titanium tritide. A preliminary series of mine tests resulted in improved electronic-circuitry waterproofing, conversion to a single-point ground system to prevent ground loop problems, addition of a heater to prevent condensation of moisture within the detector, and pneumatic balancing of the gas transport system. A reference air system was added to improve the unit's response to small or slow changes in methane concentration. Cross-talk and pickup problems were eliminated when retested and operated continuously for 48 hours, the unit gave no false positive indications of methane concentration. Unfortunately, the probe or the probe line could be damaged by large chunks of falling coal. It is though that this difficulties can be ameliorated by using flexible armored hose instead of stainless steel tubing in the sampling line. The detector has good sensitivity and high selectivity, low noise level and drift rate, and simple maintenance requirements.

19489

Lang, Helen M.; W. E. O'Neill, B. A. Cruishan, and R. W. Freedman

CONTINUOUS MONITORING OF DIESEL EXHAUST GAS FOR CARBON DIOXIDE, CARBON MONOXIDE, OXYGEN, METHANE, AND NITROGEN OXIDES. Bureau of Mines, Washington, D. C., RI 7241, 14p., March 1969. 9 refs. (PB 181186)

A monitoring system was applied to provide rapid, continuous analyses of diesel exhaust gas. Commercially available continuous analyzers with strip chart readout were explored for nitric oxide, carbon dioxide, methane, carbon monoxide, and oxygen. All five continuous analyzers performed satisfactorily during the preliminary testing and were used successfully during

several actual diesel approval tests. The results were checked by two independent analytical methods: gas volumetric and gas chromatographic analyses. It was shown that the use of nondispersive infrared analyzers is a generally accepted technique for on-stream analysis of carbon dioxide, carbon monoxide, and methane gases. Polarographic analyzers worked well for on-stream analysis of oxygen. Mass spectrometry was used to determine the nitric oxide content. Strip chart recorders provided permanent records of all concentration changes during the course of the approval tests. It was believed that the use of analyzers would speed up the diesel approval testing procedure.

15529

Johnson, J. E.; R. E. Westead, and W. D. Smith

NUCLEAR SUBMARINE ATMOSPHERES. PART 2. DEVELOPMENT OF A TOTAL HYDROCARBON ANALYZER. (Interim Report). Naval Research Lab., Washington, D. C., Chemistry Div.; NRL Problems C08-30,R05-548, C08-33, Projects SF-013-08-03-4092-4095, WW-041, SF-004-22, NRL 6056, 5p.; Jan. 30, 1964. 12 refs.
CFSTI AD 431141

An instrument was developed for the shipboard monitoring of total hydrocarbons in nuclear submarine atmospheres. In addition to total hydrocarbons, the instrument also measures methane and Freon-12 and, with a slight modification in operating procedure, Freon-11. The system is based on a chromatograph technique coupled with a highly sensitive flame ionization detector. An air sample is injected into a chromatographic column and chromatographed in the usual manner until the methane and Freon-12 peaks emerge. At this point, the flow of carrier gas is reversed and the higher hydrocarbons are backflushed from the column through the detector as a single peak. The area under the backflushed peak provides a measure of the total atmospheric hydrocarbon content. The instrument was successfully tested at sea, with hydrocarbons detected within a few minutes. The analyser is relatively insensitive to interference by water, CO2, and other organic gases.

15541

Turk, Amos, Jack I. Morrow, Stephen H. Stoldt, and Warren Baecht

ENHANCED DESORPTION OF ATMOSPHERIC SAMPLES FROM ACTIVATED CARBON. Preprint, City Coll., New York, Dept. of Chemistry, 11p.; (1963?). 7 refs.

Enhanced desorption techniques as compared with normal desorption provide significantly more information on the presence of contaminants in air, especially hydrocarbon materials, thus enabling sufficiently specific descriptions of individual atmospheres to afford valuable characterizations. The feasibility of enhanced desorption was first tested on butane and CCl_2F_2 using carbon tetrachloride as the displacing vapor. The enhancement of butane desorption ranged between 35% and 41%. The CCl_2F_2 desorption was also enhanced but to a lesser degree, possible due to the lesser difference in molecular weights between CCl_4

and CCl2F2 than between CCl4 and butane. The percentage desorption of CCl2F2, with or without CCl4, decreased in successive runs, accompanied by the formation of an insoluble white polymer that probably caused some pore blockage on the carbon surface. Preliminary tests on atmospheric samples using activated carbon (wherein carbon tetrachloride was allowed to adsorb into the carbon in vacuo and was then chromatographed) showed an increased response. Infrared spectra obtained from carbon samples exposed to air at gas sampling stations showed the following: 2160 and 2110 reciprocal cm peaks were probably CO; the broad 2080 reciprocal cm peak was indicative of CO; the 2960, 2920, and 2860 reciprocal cm bands were due to CH2 and CH3 group absorptions. Carbons of greater surface area per unit weight have a greater adsorption capacity and will adsorb more rapidly than carbons of more limited area. Charcoal with the smaller pore diameter has adsorbate molecules with a lower vapor pressure; diffusion through the narrower pores is more difficult.

15708

Hoffmann, Dietrich, Yoshito Masuda, and Ernest L. Wynder

A-NAPHTHYLAMINE AND B-NAPHTHYLAMINE IN CIGARETTE SMOKE. Nature, 221(5177):256-256, Jan 18, 1969. 8 refs.

Epidemiological data suggest an association between cigarette smoking and urinary bladder cancer in man. Identification in cigarette smoke was made of A-naphthylamine and B-naphthylamine, which are known experimental bladder carcinogens. For the quantitative analysis, A and B-naphthylamines labelled with 14C were used as internal standards. Samples isolated chromatographically were subsequently identified by mass spectrometry.

15710

Tubina, A. Ya. and I. V. Mel'nikova

METHODS OF DETERMINATION OF NITROMETHANE AND NITROETHANE IN THE AIR PRODUCTION INSTALLATIONS. (Metody opredeleniya nitrometana i nitroetana v vozdukhe proizvodstvennykh pomeshchenyi). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, vol. 6:49-50, 1969.

A polarographic method for detecting nitromethane and nitroethane and a colorimetric method for detecting nitromethane in air are described. The polarographic method adequately detects 0.2 microgram of nitromethane and 0.25 microgram of nitroethane per milliliter of water. The colorimetric method is capable of detecting 0.2 microgram of nitromethane in 2 milliliters of solution. A 0.2 liter air sample is thus adequate for detecting concentrations of these components at levels 3-15 times below permissible values.

15749

Ludwicka, Antonina

THE PROJECT OF NORMALIZED METHOD FOR DETERMINATION OF VAPORS OF

BENZYL CHLORIDE IN AIR. /projekt oznaczania benzylu w powietrzu/. Method oznaczania par chlorku benzylu w powietrzu. Text in Polish. Med. Pracy (Warsaw), 20(6):425-429, 1969.

Two standardized methods for the determination of benzyl chloride vapor in air were discussed which use nitration or pyridine. The nitration process consisted of nitrating benzyl chloride to form 2,4-dinitrobenzyl chloride. Methyl ethyl ketone was added to extract 2,4-dinitrobenzyl chloride. Potassium hydroxide was then added and the resulting violet color determined the concentration. The reaction of warmed pyridine and sodium hydroxide or benzyl chloride resulted in a yellow-orange solution which also determined the concentration. The analysis for both methods was 1 mg/cu m or 5 mg/cu m, depending upon the amount of air sampled.

19763

Candeli, A. and G. Morossi

THE PROBLEM OF THE CARCINOGENICITY OF ATMOSPHERIC POLLUTANTS. III. THE RADIOACTIVE TRACER TECHNIQUE FOR THE QUANTITATIVE DETERMINATION OF AROMATIC POLYCYCLIC HYDROCARBONS. /Il problema della cancerogenicita dell'aria inquinata: III. Tecnica dei traccianti radioattivi per la determinazione quantitativa degli idrocarburi aromatici policiclici/. Text in Italian. Giorn. Igiene Med. Prevent. (Genoa), 10(1):3-15, 1969. 20 refs.

A tracer technique using H 3- labeled 3,4-benzopyrene was employed to determine the extent of 3,4-benzopyrene loss during analytical procedures such as column chromatography followed by paper chromatography. The H 3-labeled benzopyrene was added to a solution of pure aromatic polynuclear hydrocarbons as an internal standard. The amount of H 3-labeled benzopyrene was determined at the beginning and end of the analysis by a liquid scintillation counting technique. The experimental results showed that the recovery percentage of tritiated 3,4-benzopyrene corresponds to the recovery percentage of the non-tritiated 3,4-benzopyrene. The tracer technique was also satisfactory with other polynuclear compounds. The loss of the polynuclear compounds was about 30% after column chromatography and 50% after paper chromatography. The analysis of the particulate matter of gasoline engine exhaust gases showed a loss of the tritiated compound which was similar to that revealed on mixtures of pure aromatic polynuclear compounds. (Author summary modified)

19802

Hollis, O. L.

SEPARATION OF GASEOUS MIXTURES USING POROUS POLYAROMATIC POLYMER BEADS. Anal. Chem. (U. S.), 38(2):309-314, Feb. 1966. 5 refs. (Presented at Advances in Gas Chromatography, Third International Symposium, Houston, Texas, Oct. 1965.)

Outstanding separations of volatile compounds were achieved with columns of polyaromatic polymer beads synthesized by suspension with a diluent to give a highly porous structure. Notable sharp, symmetrical peaks, and low retention volumes were found for water, alcohols, and glycols. These polymers package have

partition properties of a highly extended liquid surface without the problems of support polarity, liquid-phase volatility, or freezing point which hamper gas-liquid chromatography. The porous polymers can be synthesized from monomers such as styrene, tertiary-butylstyrene, and ethylvinylbenzene with divinylbenzene as cross-linker. Applications of porous gel polymer columns range from the analysis of oxides of nitrogen to the determination of diethylene glycol in dipropylene glycol. The analysis of trace quantities of water in a variety of materials is greatly facilitated because water is eluted very rapidly with good peak shape from the columns. The columns are also useful where the adsorptive properties of the stationary phase contributes to tailing or skewing of the peak from materials such as carbon dioxide and acetylene on gas-solid chromatographic systems and water on most gas-liquid chromatographic systems. (Author abstract modified)

15899

Friedrichs, Karl-Heinz and Arthur Breckhaus

MEASUREMENTS OF PARTICULATE AIR POLLUTANTS WITH TWO FILTER APPARATUS OF DIFFERENT UPPER SEPARATION LIMITS. (Messung partikelförmiger Luftverunreinigungen mittels Filtergeräten unterschiedlicher oberer Abscheidegrenze). Text in German. Staub, Reinhaltung Luft, 29(11):467-470, Nov. 1969. 3 refs.

Filters for the preliminary separation of coarse particles by the forces of gravity and inertia were used in the atmosphere. The separation of the aerosol into two portions permitted aerosol size to be compared at different measuring points. Chemical analysis showed a considerable difference between the composition of the fine and coarse particles. Hydrocarbons and 3,4-benzopyrene were found in the fine aerosol. (Author summary modified)

15904

Brennan, Robert G.

EMISSION-TYPE DISCHARGE STUDY OF SOME AIR POLLUTANT COMPOUNDS. Preprint, American Chemical Society, Washington, D. C., Div. of Water and Waste Chemistry, 16p., 1969. 3 refs. (Presented at the American Chemical Society, 158th National Meeting, Division of Water, Air, Waste Chemistry, New York, Sept. 8-12, 1969.)

The applicability of a four-channel DC discharge system to gas chromatographic analysis of air pollutants was investigated in laboratory analyses of automobile exhaust and other gas mixtures. Air pollutants studied included carbon monoxide, sulfur dioxide, nitrogen oxides, and carbonyl sulfide. Alkenes, alcohols, and other compounds were also investigated for comparison purposes. The four major wavelengths observed were 5165 Å; 4372 Å; 4216 Å; and 4362 Å. The detector gave good response patterns suitable for qualitative identification of gases and pollutants and was particularly useful in confirming the identity of air peaks, hydrogen, CO, hydrocarbons, and CO_2. Limits of detection are in the ppm range. The limits need improvement if sub-ppm

concentrations are to be directly analyzed and detected in air. Data presented in the form of tables include wavelength and band/line spectra of analyzed compounds, response data, and emission ratios for a series of alcohols.

19969

Tsuda, Mitsushige, Shigetaru Hatano, and Shuji Misuta

CONTINUOUS SAMPLING OF AUTOMOBILE EXHAUST GAS AND ADJUSTMENT OF STANDARD GASES. Mitsubishi Heavy Industries, Ltd., Tech. Rev., 6(3):90-96, Sept. 1969. 8 refs.

Among the problems involved in analyzing automobile exhaust are the techniques to be used in continous exhaust gas sampling and in handling the standard gas to be used for calibration of the analytical equipment. Cooling and dehumidifying of exhaust gas is of particular importance in continous sampling. The cooling temperature must be maintained below 41 F. Selection of materials for the gas channel of an analyzer and the prevention of hydrocarbon adhesion to filter surfaces are of particular importance in minimizing measurement errors. To increase the responsiveness of the analyzer, the volume of gas passage inside the channel must be as small as possible and the flow of sampled gas as large as possible. Continous measurement of total hydrocarbons in exhaust gas is possible by combining a continuous sampling channel with a flame ionization detector. The measuring range of such an analyzer is 100 to about 42,000 ppm methane and 15 to about 7000 ppm n-hexane. Required concentrations of the standard gas can be correctly determined by combustion methods for hydrocarbons and by the Orsat method for CO-CO2-O2 mixed gas. Standard gas whose concentration is guaranteed by the above methods should be used in calibrating an analyzer. (Author conclusions modified)

19968

Rubberti, Anil R.; T. Erdman, M. H. Trieff, and R. L. Gabriel

EVALUATION OF THE ADSORPTION PROPERTIES OF MOLECULAR SIEVE 569 COATED WITH 10% WT/WT TRITON X100. Preprint, Drexel Inst. of Technology, Philadelphia, Pa., Dept. of Chemistry and Drexel Inst. of Technology, Philadelphia, Pa., Environmental Engineering and Science Program, 11p., 1968. 1 ref.

The usefulness of molecular sieve 569 coated with 10% Triton x-100 as a desiccant for removing moisture from a gas stream was established in experiments which showed that water had no effect on the elution of benzaldehyde, pentyl acetate, n-butyl alcohol, or hexane at 50 C in a gas chromatographic column. In experiments with an uncoated sieve, hexane was retained by the column at 50 C. At 100 and 200 C no desorption was observed. When the coated sieve system is run for 10 min at 2.5 l/min flow rate, quantitative recovery for hexane and butanol is about 100%; for pentyl acetate, 85%; for benzaldehyde, 70%. When the system is run longer than 10 min, all recoveries approach 100%. Recommended procedures for regenerating the coated sieve are given. Use of the coated molecular sieve for collection of organic components present in air are discussed.

15899

Hensing, A. J.

QUANTITATIVE DETERMINATION OF CARCINOGENIC HYDROCARBONS THROUGH FLUORESCENT SPECTROPHOTOMETRY. (Carcinogen szenhidrogenek mennyiségi meghatározása fluorescens színképelemzéssel). Text in Hungarian. Egészségtudomány, 11(2):131-135, 1967. 9 refs.

The aromatic hydrocarbon content of air samples amounts to 1-100 ppm of the solutions prepared for spectrophotometric analysis. If the solutions are not purified by chromatography, the results of the spectrophotometry will be rather uncertain. The method reported here combines chromatographic purification of the solution at room temperature with spectrophotometry at -196 C. Liquid nitrogen is used for cooling because of this low temperature the spectrograph shows very sharp lines. The low temperature measurement is very fast and provides advance information on whether time-consuming deep-cooling is warranted. The chromatographic purification process uses an aluminum trioxide column.

16016

Marsh, K. J.

THE MEASUREMENT OF AIR POLLUTATION AROUND OIL REFINERIES. British Petroleum Co., Middlesex, England, Dept. of the Working Group 'Stack Height and Atmospheric Dispersion', Concawe, The Hague, Netherlands, 15p., Jan. 1968. 13 refs.

Principles of air pollution measurements are summarized to guide oil refineries in planning emission measurements and analyzing emission data. Pollutants considered are sulfur dioxide, hydrogen sulfide, mercaptans, smoke, solids such as grit and acid smuts, nitrogen oxides, hydrocarbons, ozone, and other oxidants. The advantages of using new commercial instruments for continuous or consecutive measurements at fixed sites are contrasted with discontinuous methods using discrete samples. To determine the long-term pollution pattern around a refinery, data must be accumulated for a number of years and cumulative frequency curves derived for various concentrations of a pollutant at each measuring point. Such a curve can be used to determine the 'dosage' at each point and the damage caused by pollution. The effect of wind direction on pollution measurements must also be determined. To do this, measurements at each point are grouped according to the principle wind directions, a cumulative frequency curve is derived for each group, and concentrations obtained from the curve are plotted on vector diagrams similar to wind roses. These vector diagrams will tell whether changes in frequency distribution of pollutants are due to refinery operations or variations in weather.

16132

Saitoh, Takeshi, Takeichi Hiramatsu, Tatsuyuki Takahashi, Tsunemi Takemura, and Shiro Ochiai

INFLUENCE OF ENGINE VARIABLES ON EXHAUST EMISSIONS FROM AUTOMOBILE

ENGINE DURING ACCELERATION. Bull. Sci. Eng. Res. Lab. (Tokyo), no. 45:70-82, 1969. 7 ref.

A method was developed to test transient performance of automobile engines on an engine test bench equipped with an inertia wheel and a dynamometer controlled by an analogue computer. The air-controlled disc brake and the clutch actuator were incorporated in this acceleration equipment to simulate the start of the vehicle. Accuracy and reproducibility of the equipment and method were satisfactory. The influence of engine variables on the concentrations of CO and hydrocarbon in the engine exhaust was studied with this acceleration simulator. The CO and HC concentrations during acceleration were the same as the exhaust composition of the steady running engine. As a consequence, exhaust compositions during acceleration could be estimated from those in the steady state.

16170

Scherber, F. J. and J. H. Steudemire

A MOBILE TEST STATION FOR MOTOR VEHICLE EXHAUST. Bendix Tech. J., 2(3):98-100, Autumn 1969. 4 refs.

The design of a fully integrated mobile test station was described with emphasis on test-cycle criteria and instrumentation techniques. Key components and functions performed in the test facility include nondispersive infrared spectrometers for carbon monoxide, carbon dioxide, and hydrocarbon analyzers, variable-flow, fixed-dilution, or variable-dilution sampling, a chassis dynamometer for engine loading, and integrated circuits on printed-circuit cards for sensor signal conditioning. Also included are reed switches driven by the program clock for sensor scanning, a keyboard for manual inputs, and the best available diagnostic sensors for engine diagnosis. One of the most important factors governing selection of a suitable testing cycle is the time restriction imposed; no more than five minutes may elapse between drive-on and drive-off with hard copy test data. A procedure under consideration is a high-speed conditioning cycle followed by a medium speed surveillance cycle, the total test time being 155 seconds. Exhaust emission levels must be capable of direct correlation with Federal standards in order that a meaningful pass or fail status can be readily assigned to each vehicle tested. A number of approaches to the automation of vehicle-exhaust gas analysis were proposed which call on a variety of techniques, among them analog, digital, and hybrid schemes which vary in complexity with the intended application. Visual aids in the test vehicle and on the mobile laboratory control panel will permit both the vehicle driver and the dynamometer operator to monitor the test-cycle modes. The gas levels measured for each mode of the test cycle will be automatically recorded on punched cards for immediate computation of concentration and mass-per-mile values. The Prins Data Center will be used to interface the analog outputs of the analyzers with the punched card terminal equipment. The modular concept utilized in the design of the Prins Data Center permits its adaptation to a wide variety of systems configurations. All functional circuits are contained on plug-in printed-circuit cards which can be selected on the basis of the characteristics required to provide any specified over-all system performance.

19211

Baernert, Juergen and Reiner Engefeld

EXPERIENCES WITH A MODIFIED METHOD FOR DETERMINATION OF THE TOTAL AMOUNT OF COMBUSTIBLE ORGANIC SUBSTANCES IN WASTE GASES.
(Erfahrungen mit einer modifizierten Methode zur Bestimmung der Gesamtmenge verbrennbarer organischer Substanzen in Abgasen).
Text in German. Wasser, Luft Betrieb, 12(7):422-425, July 1968.
6 refs.

A plant manufacturing glass fiber insulating panels, a brake lining manufacturing plant, a wire manufacturing plant, and two chicken manure drying stations are discussed with respect to how they determine organic substances in waste gas. In the first three plants, vapors from solvents and phenols and their cracking products were analyzed. In the first case, 3 silica gel probes were used since it was not known how the method would respond to mineral oils. However, hydrocarbons could be detected at all measurements. With larger volumes drawn through the probes within an equal period of time, a higher loading of probe 2 was observed. This may be explained by the fact that of the water vapor/oil mixture, the former shows greater affinity to the silica gel than the latter, which impairs the oil mist adsorption. The result of 30 measurements in the second plant showed that the carbon concentration in the uncleaned gas experienced a maximum at each temperature increase which subsided until the next temperature increase. The carbon concentration of the cleaned gas is almost independent of time, which indicates that the afterburning system has an efficiency of more than 90%. Generally it can be said for all measurements in all three types of plants that no major difficulties were encountered. Quantitative adsorption was achieved in almost all cases in the first section of the first silica gel probe. The result of measurements in the chicken manure drying plants showed that the initially present mercaptans appeared in none of the analyses, which indicates that they are oxidized to sulfates. It was further found that these gases contain further organic emission components which can presently not yet be identified (presumably fatty acids and their derivatives).

19277

Hill, D. W. and H. A. Hewell

THE VARIATION WITH POLARISING VOLTAGE OF THE RESPONSE TO METHANE, CARBON DIOXIDE AND NITROUS OXIDE, OF A HELIUM-ARGON IONISATION DETECTOR FOR GAS CHROMATOGRAPHY. J. Chromatog., Vol. 32:707-719, 1968. 15 refs.

Response curves with unexpected characteristics were obtained for methane, carbon dioxide, and nitrous oxide during an investigation of the physical processes governing the operation of a helium-argon ionisation detector. A previously recorded response vs polarising voltage for an argon detector to various concentrations of propane is contrasted with the obtained response vs polarising voltage of an argon detector to various concentrations of methane. The former is the commonly recorded response to organic vapors with ionisation potentials less than the energy of the argon metastable atom. The methane curve illustrates a reversal of sign with

voltage increase. This variation could explain previous, contradictory observations at unquoted field strengths. At low applied voltages, the positive responses for methane, carbon dioxide, and nitrous oxide are reported to have similar form, with carbon dioxide having nearly twice the response of methane and nitrous oxide. The negative response observed at the high voltage region was approximately identical for all three vapors. At 30 V, when the response of each gas was at a maximum, the response of carbon dioxide coincided with that of propane. The results are in contrast to predictions that responses to methane, carbon dioxide, and nitrous oxide would not occur, since the ionization potentials of the substances are higher than the argon metastable level. It is suggested that the positive responses are due to lower recombination coefficients resulting from a lowering of primary electron temperature by inelastic collisions with added gas molecules.

16361

Kessler, P. L.

QUALITY CONTROL ASPECTS OF CHRYSLER'S CLEANER AIR SYSTEM. Preprint, American Society for Quality Control, Milwaukee, Wis., 11p., 1968. (Presented at the Conference American Society of Quality Control, 22nd Annual Technical, Philadelphia, Pa., 1968.) (Also: Automotive Industries, 141(9):74-97, Oct. 1, 1969.)

The quality control procedures of Chrysler's program to comply with Federal limits on allowable concentrations of certain automobile emissions is described. The basic equipment for the testing comprises tanks of purging and calibration gas, a non-dispersive infrared analyzer with recorders, dynamometer instruments and driver's aid, a mass test console, and digital computer and typewriter. Personnel required to operate the test facility are two driver-mechanics, a quality control engineer, and an analyzer-operator. A complete test consists of three cycles, the first being a 'dummy' run to ensure proper engine conditioning; each cycle in turn consists of ten operating conditions, or modes, which require 117 seconds to complete. A vehicle fails the test if the emission level exceeds 275 ppm hydrocarbons and/or 1.5% carbon monoxide content; or if spark timing, idle rpm, distributor vacuum and/or idle CO content exceed the specified limits. Rechecks and adjustments are made on any vehicle which fails; if it does not then pass re-testing, the carburetor and/or distributor are replaced. An important aspect of the quality control program is the series of controls exercised at the plants that supply auto components; these controls are particularly carefully applied to suppliers of carburetors and distributors and at engine-building plants.

16362

Vinios, J.-P. and M. Leuckel

METHODS AND INSTRUMENTS UTILIZED AT THE F.R.I.F. EXPERIMENTAL STATION FOR THE MEASUREMENT OF DIFFUSION FLAMES. (Methodes et instruments utilises a la Station Experimentale de la F. R. I. F. pour des mesures dans les flammes de diffusion). Text in French. Rev. Combust., 23(9):827-837, Sept. 1969. 4 refs. (Presented at

the Conference 'I Problemi delle Combustione - Provvisori' de l'Associazione Termotecnica Italiana, Milan, June 18-19, 1969.)

The investigation of turbulent diffusion flames is a highly complicated field of work, calling for a large number of experimental data. For this purpose, two square section experimental furnaces were built: one 6.5 m long and 3 m wide; the other, 10 m long and 1.5 m wide. The instruments used offered extremely quick measurement readings, were compact, and highly heat and corrosion resistant. Temperature was measured along the furnace walls and on the gases of combustion. To measure velocities, a Prandtl tube, parallel with the flame axis, was employed. To analyze the combustion products sampled at various points of the flame, the expedient was adopted of cooling them quickly to arrest the chemical combustion reactions. Chromatography was used to analyze H_2, CO_2, O_2, N_2, CH_4, CO. Hydrocarbon levels were also assayed considered as C_2, C_3, and C_4. To determine unburned solids, a sample of gas was filtered under isokinetic conditions. (Author summary modified)

16398

Boyce, Claudia Margaret

STUDIES OF THE DETERMINATION AND REACTIONS OF SULFUR DIOXIDE AS AN AIR CONTAMINANT. Colorado Univ., Boulder, Thesis (Ph. D.), 1968 Xerox, Mich., Univ. Microfilms, Inc., 1968, Sep. 98 refs.

Analytical methods for sulfur dioxide determination, including colorimetric and conductrometric methods, were evaluated, and the reactions of sulfur dioxide with hydrocarbons and nitrogen oxides at high dilution in air were studied. Radioactive $S(^{35})O_2$ was used as a tracer to follow SO_2 in the gas phase and after its absorption in the sampling solution. The West-Gaeke colorimetric method gave slightly less color but better reproducibility and sample stability than the Natelg-Gordon method. Liquid scintillation counting showed that the dilute hydrogen peroxide-sulfuric acid solution used for absorbing SO_2 in the Thomas conductometric method was also less sensitive and less reproducible than the West-Gaeke colorimetric method. It was emphasized that the use of bubblers in series is not necessarily a reliable method for assuring absorbing efficiencies of solutions for gases. None of the mixtures showed any measurable amount of reaction of SO_2 in dry or moist air in the dark during residence times as long as three weeks. Since there was a reaction of SO_2 in an irradiated mixture containing both SO_2 and hexene in dry air but none with either SO_2 or hexene alone, it seemed probable that SO_2 reacts with a product of the hexene-SO_2 photolysis. There was no appreciable SO_2 reaction in an irradiated mixture with benzene alone or in the presence of SO_2. All products of the SO_2 reactions were absorbed, since both color and counts were low in the gaseous aliquots taken from flasks immediately after irradiation. Whether the SO_2 is oxidized or held in some form not detectable by colorimetric analysis is not known. It is definite that those reaction products which do not react as SO_2 in the colorimetric determination do not remain in the gaseous phase. (Author abstract modified)

16507

Weistenhoime, R. F.

METHANE DETECTION. Colliery Guardian (London), 217(1):47-58, Jan. 1969. 5 refs.

A recording methanometer and a specially designed recording air-flowmeter were used to obtain continuous measurements of the total quantity of firedamp emitted from a longwall coalface. The sources and variations in total firedamp emission from a production longwall unit were also analysed. Results showed it was possible to split the readings of firedamp emission into different trends and to correlate the results to coalface activities. Firedamp emissions from coal cutting operations were shown to be reasonably constant, whereas emissions from adjacent strata were found to be cumulative with time. The complex nature of the variations measured emphasise the inadequacies of spot measuring techniques. The results indicated numerous ways in which research into firedamp emission could be extended utilising continuously measuring instruments. It was shown possible to continuously record the variations in air quantity circulating a unit and the variations in firedamp content of that air. By recording the variations in a number of units in a mine district and also recording the variations in pressure across the units, it would be possible to relate changes in firedamp emission to absolute values of coalface resistance. A set of instruments on the main return from the district could be used as a check on the total variations. The recording airflow meters were found to be reliable research instruments although requiring regular maintenance. The main hazard to their performance was the presence of dust which resulted in a loss of sensitivity. Regular laboratory checks, however, indicated that this did not affect the calibration. Definition of the normal sources variations, and magnitude of firedamp emission by the methods described, could prove an invaluable aid in increasing the confidence with which abnormal trends can be identified and analysed.

16518

Hirao, Leon and Raul Chaikin

DEVELOPMENT OF A SIMPLE AUTO EXHAUST ANALYZER. (FINAL REPORT.) Stanford Research Inst., Menlo Park, Calif., Contract PH 86-66-60, SRI Proj. PRU-5059, 19p.; Aug. 1966. 23 refs.

The feasibility of applying a heated filament combustible gas detector for separately analyzing the total hydrocarbons and carbon monoxide in auto exhaust gases was determined. The first phase was a detailed study of the filament temperatures required for oxidation of selected hydrocarbons and CO on a platinum filament. Additional work was conducted on the effect of O2 and hydrocarbon concentration on the oxidation initiation temperature; the interacting effects in simple gas mixtures were studied. The data showed that the required analyses could not be made on the basis of the platinum filament temperature. Rhodium, iridium, palladium, palladium-silver, and palladium-gold alloys, oxidized nickel, gold, and oxidized cobalt were tested in a search for materials which might show greater selectivity in catalyzing oxidation of hydrocarbons and CO. None of these materials were

found to make the required analyses feasible on the basis of filament operating temperature. Two procedures were evaluated for making a preliminary separation before analysis with a heated filament. Hopcalite catalyst was used to remove the CO from the gas sample by selective oxidation. Problems associated with the adsorption of hydrocarbons on Hopcalite made the procedure of doubtful use. Silica gel was used to selectively remove hydrocarbons from the gas sample so that an analysis for CO could be made on the heated filament. The complications it introduced were such that the basic simplicity of the combustible gas detector was lost. Since the separate analyses for hydrocarbons and carbon monoxide did not seem feasible, an effort was made to construct a detector that would measure total combustibles minus hydrogen and the lower aliphatic hydrocarbons. The procedure utilized a platinum wire 'preburner' whose function was to selectively combust hydrogen. This procedure did not succeed because carbon monoxide was found to inhibit the selective combustion of hydrogen over platinum at low temperatures. It was concluded that the combustible gas detector does not show any great potential for auto exhaust analysis. (Author summary modified)

16620

Freeman, M. W. and M. W. Lang

A COMPARISON OF INFRARED AND GAS CHROMATOGRAPHIC METHODS FOR DETERMINATION OF METHANE IN MINE AIR. Bureau of Mines, Washington, D. C.; RI-7179, 9p.; Sept. 1968.
CFSTI: PB 180672

The gas chromatographic method was compared with the infrared method used for confirmatory determination of methane in mine air. In terms of speed, convenience, and precision, the gas chromatographic method was far superior to the infrared method. The comparable infrared analysis required almost a full day per sample; the gas chromatographic analysis could be performed in 10 min, including sample injection and calculation. Replicate analyses were unnecessary. Only one or two standards had to be run per day because of the lack of drift and the high degree of precision. A coefficient of variation of less than 1% was attainable. Separation of methane from other hydrocarbons was complete with the use of molecular sieve columns under proper experimental conditions. This provided the specificity for methane that is essential. The amount of sample required for the chromatograph was only 10 ml compared with 100 ml or more for the infrared cell. The need for such a small quantity indicated the possibility of taking mine-air samples in syringes. This would save space, weight, time of sampling, and time of injection into the instrument, and would avoid the use of mercury for gas transfer. (Author conclusions modified)

16701

Neil, J. M., Sue Ireland, and A. M. Spears

IDENTIFICATION OF AROMATIC KETONES IN CIGARETTE SMOKE CONDENSATE. Anal. Chem., 41(2):310-313, Feb. 1969. 12 refs.

Because of the complexity of cigarette smoke, extensive fractionation was necessary to isolate and identify minor components. The separation techniques involved solvent partition, column, paper, and gas chromatography. The gas chromatographic system allowed the collection of smoke constituents for subsequent analysis by ultraviolet and infrared spectroscopy and mass spectrometry. From the study of one subfraction which represents 0.08% of the original weight of the condensate, fluoren-9-one, the four methylfluoren-9-ones and seven other alkylated fluoren-9-ones were identified. (Author's Abstract)

E. CONTROL METHODS

00001

HEARINGS - S 306, A Bill to Amend the Clean Air Act to Require Standards for Controlling the Emission of Pollutants from Gasoline-Powered or Diesel-Powered Vehicles, to Establish a Federal Air Pollution Control Laboratory and for Other Purposes. 89th Congress (1st Session) Senate Committee on Public Works, Special Subcommittee on Air and Water Pollution. April 9, 1965. 308 pp.

This document contains Government reports, statements made by Government officials and industrial representatives, and communications to Senator Muskie. The following topics are discussed: (1) photochemical smog; (2) effects of air pollution; (3) vehicle use trends; (4) recognition by state governments; (5) exhaust and crankcase emission control; (6) fuel evaporator loss control; (7) fuels; and (8) diesels. Also included are reports on causes and control of automotive emissions, by J.D. Caplan; and descriptions of visits to General Motors Research Laboratories, Ford Motor Co. Vehicle Emissions Testing Laboratory, American Motors Corp. (Air-guard system for exhaust control), and to Chrysler Corp. Laboratories (Clean air package components).00

00015

L. J. E. Hofer, J. F. Shultz, and J. J. Feenan

EFFECT OF LEAD DEPOSITS ON ACTIVITY OF AUTOMOTIVE EXHAUST CATALYSTS. Bureau of Mines, Washington, D.C. (Report of Investigations 6243.) 1963, 26p.

This study, part of a broad program of research in air pollution related to minerals, was conducted to determine the nature and extent of the poisoning of catalysts when used to remove certain air pollutants from exhaust gases. The poisoning examined in this investigation occurs when leaded gasoline is used as a fuel for automotive engines. The smog in the Los Angeles area is attributed to the effect of radiant energy on the mixture of hydrocarbons and nitrogen oxides found in the atmosphere there. To prevent the escape of these hydrocarbons into the atmosphere catalytic mufflers have been proposed. In principle, these are simple and nonmechanical, consisting of a vessel charged with a catalyst capable of destroying the exhaust hydrocarbons by catalyzing their oxidation. However, these catalysts are severely affected by the particulate matter, mainly in the form of lead sulfate, lead oxysulfate, and lead chlorobromide, contained in the exhaust gas. Deposition of lead on the catalyst restricts catalytic activity. After 20,000 miles of operation, the temperature necessary to achieve 50% conversion of isopentane in a mixture of 0.2% isopentane, 2% CO and 8% oxygen, and the

balance H at 10,000 hourly space velocity has risen from 400 to 500 C, even with a catalyst taken from the exit portion of the catalyst bed. The rest of the catalyst was more severely affected. It would appear that operation for 20,000 miles is near the limit for a catalyst.##

00057

R.D. Kopa

PNEUMATIC FUEL ATOMIZATION AS APPLIED TO AUTOMOBILE AIR POLLUTION CONTROL. California Univ., Los Angeles. Dept. of Engineering. (Dept. No. 63-61.) Dec. 1961. 19p.
CFSTI, DDC: AD 601025

The principle of pneumatic fuel atomization as applied to internal combustion engine carburetion was conceived during research activity concerned with exhaust gas recycling and its effects on engine performance. The goal was to find a solution to this engine "power surging" problem, a phenomenon resulting from exhaust gas recycling as a method of nitrogen oxide control. The test results were obtained during the operation of an engine equipped alternatively with a factory standard carburetor or with a fuel atomization device. The earlier developed exhaust gas recycling devices installed on engines equipped with standard carburetors were extensively road tested. They proved to operate trouble-free for test periods extended over 10,000 miles of driving. Nitrogen oxides reduction averaged 60% and the specific fuel consumption remained substantially unchanged. The fuel atomization device eliminates the "power surging" noticeable with the earlier recycling device, and since it combines the exhaust gas recycling with fuel-air mixture homogenization, an additional benefit, namely, substantial reduction of unburned hydrocarbons and of carbon monoxide is obtainable. More research work, however, is needed in order to gain a conclusive picture about the full potential of pneumatic fuel atomization as a method of automotive air pollution control.##

00087

A.P. Bush, R.A. Slater, J. Dyer, G. Richards

THE EFFECTS OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. California Univ., Los Angeles, Dept. of Engineering. (Dept. No. 63-61.) Dec. 1962. 18 pp.
CFSTI, DDC: AD 297976

In order to determine the probable composition of the atmosphere after automobile exhausts are controlled, tests were conducted using the air pollution test facility on the campus at UCLA. Automotive vehicles were studied with and without afterburners using various concentrations of auto exhaust during simulated driving cycles. The objective of the experimentation was to simulate ambient atmosphere and to test this atmosphere for contamination by exposing known sensitized plants to it and testing its ability to produce human eye irritation. Indications are that atypical plant damage reported is due to oxides of nitrogen. Investigations showed that, in all instances of elevated formaldehyde measurements, eye irritation resulted.##

00097

L.L. Winkstrom K Sobe

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. California Univ., Los Angeles, Dept. of Engineering. (Report 61-19.) Apr. 1961. 40 pp.
CFSTI, DDC: AD 406814

Reactions of the oxides of nitrogen are of considerable interest in current air pollution research. The investigation reported in this paper is the study of the complete dissociation of NO2 in nitrogen and in air with CuO-Alumina (1:1) and CeO2-Alumina (1:1) catalysts. The initial concentration of the NO2 was varied within the range 720-2200 ppm. The reaction was studied in a steady-state isothermal flow reactor with the temperature varied in the range 304 - 520 C at gas space velocities (STP) ranging from 1,400 to 11,200/hr. It was observed that the kinetic data were best represented by the rate expression, r=ap / (1 plus bp). At low temperatures and high flow rates the rate reduced to a zero order reaction. Below 480 C the CuO had a higher catalytic activity than the CeO2. Above 480 C, however, the CeO2 had a higher activity. It was observed that there was considerable decomposition of NO2 even in excess air with CuO catalysts. Since it had been reported previously that CuO catalysts were quite satisfactory for hydrocarbon oxidation, the results of this investigation indicate that both hydrocarbons and oxides of nitrogen may be simultaneously eliminated to a considerable degree with CuO catalysts. (Author)##

00101

P. Gustafson and S. R. Smith, Jr.

REMOVAL OF ORGANIC CONTAMINANTS FROM AIR BY TYPE 13X MOLECULAR SIEVE. Naval Research Lab, Washington, D.C. (NRL Rept. 5560.) Dec. 6, 1960. 20 pp
CFSTI: AD 248512

The adsorption of low concentrations of n-decane, methane, benzene, toluene, xylene, pyridine, aniline, and nitrobenzene on type 13X Linde molecular sieve has been studied at influent concentrations of from 5 to over 100 ppm and superficial linear velocities (velocities if no sieve were present to reduce the cross section) of up to 3000 cm/minute. The breakthrough weight capacity at a flow rate of 2500 cm/minute for a representative aliphatic compound (n-decane) was 10 wt-% of the sieve and for a mononuclear aromatic (benzene) was 0.35 wt-% at 25C. Decreasing the flow rate of the aromatic to 500 cm/minute increased the breakthrough capacity to 2.1%. Regeneration conditions were also studied. Water vapor readily displaces organic adsorbates (except high boiling polar compounds) at room temperature. Therefore, molecular sieve with coadsorbed water may be reactivated by passing dry air at 200 to 325C in the same direction of gas flow as that used during the adsorption cycle. The coadsorbed water will displace the sorbed organic compounds as it moves down the column, whereas the organic materials would be pyrolyzed in place if the water were not there. (Authors' abstract)##

00257

A. G. Sandoszinsky, D. M. Benforado, L. D. Grasso, and C. E. Paulette

FUME CONTROL IN RUBBER PROCESSING BY DIRECT-FLAME INCINERATION.
J. Air Pollution Control Assoc., 16(12):671-676, Dec. 1966 (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., Paper 66-59, June 24, 1966.)

The application of direct-flame incineration to successfully eliminate a smoke-oil-mist and odor problem in the manufacture of rubber-base rug underlay is presented. The investigation of various air pollution control processes leading to the development and adoption of the direct flame incineration system is covered. The rug underlay curing process incorporating the direct-flame incineration system with primary heat recovery is described. Results and discussion of a source test to determine the effectiveness of direct-flame incineration in this application are included. (Authors' abstract)##

00269

W. H. Luther, H. Lehner, H. Muller, and W. Zander

POSSIBILITIES OF DECONTAMINATING EXHAUST GASES OF OTTO ENGINES.
Moglichkeiten einer Entgiftung der Abgase von Ottomotoren.
Erdoel Kohle (Hamburg) 18(12):966-972, Dec. 1965. Text in German.

The composition of motor exhaust gases is discussed. Measuring methods and the possibility of decontamination before, in, and behind the combustion chamber are described in detail. Fundamental principles of the Cleaner Air Package, crankcase blowby control devices, after-burner with spark ignition, and the Man-Air-Ox system are given. The state of the art of catalytic combustion is summarized and it is shown that the combination of other after-burner systems with small catalyst units are worthy of further development.##

00271

SUBMARINE ATMOSPHERE HABITABILITY DATA BOOK (REVISION-1).
Navy Dept., Washington, D. C., Bureau of Ships
(NAVSHIPS 250-649-1). Sept. 1963. 198 pp.

This publication brings together scattered information and references to more detailed information on chemical principles, experimental results, and operating experience concerned with maintenance of atmospheric habitability in nuclear-powered submarines. Habitability is defined as control of chemical aspects of the atmosphere to meet the requirements of equipment and personnel. Recommended methods for removal of carbon dioxide, carbon monoxide, hydrocarbons, ammonia, and odors are discussed. Basic operation of an electrostatic precipitator is described. Details are given on the continuous air monitoring system required to insure safe operation of the submarine.##

00538

J. Schuite

SEALED ENVIRONMENTS IN RELATION TO HEALTH AND DISEASE. J. Inst. Heating Ventilating Engrs. (London), Vol. 34:79-87, June 1966.

The general health aspects of life in a sealed environment are related primarily to habitability and atmospheric control. The control of the atmosphere involves: (a) some means to provide the continual addition of oxygen in sufficient quantity to support life and preserve health, and (b) methods to effect the continuous removal of carbon dioxide, carbon monoxide, and other atmospheric contaminants to prevent them from gradually increasing to concentrations which could produce illness. A number of the atmospheric constituents are discussed in detail in regard to their source, effects upon health, and methods of control. The need for control of temperature and humidity and for protection from radiation has also been included in the discussion. These needs and methods for controlling the atmospheric constituents, temperature, humidity, and radiation exposure in a sealed environment have been projected to the future space vehicle.##

00562

E. Hunigen and W. Prietsch

THE ELIMINATION OF NOXIOUS SUBSTANCES FROM INTERNAL COMBUSTION ENGINES. Probleme und Losungswege der Schadstoffbeseitigung bei Verbrennungsmotoren. Technik (Berlin), 21(6):377-381, June 1966.

Control of air pollution from internal combustion engine is reviewed. A table is given of maximum permissible concentrations of various components of exhaust gases for both Germanies, the USSR, and USA. The review emphasizes methods of measurement of various pollutants.##

00581

D.E. Cooper, H.E. Grinwald, B.H. Levin, E. W. Stokeld

IMPROVED DESORPTION ROUTE TO NORMAL PARAFFINS. Chem. Eng. Prog. 62(4):69-74, April 1966.

In the over-all processes economics, desorption of the n-paraffins from the molecular sieve is the most important step of the Texaco selective finishing process. There are basically five vapor phase techniques for desorbing n-paraffins from molecular sieves: (1) thermal swing, (2) pressure swing, (3) sweeping with a nonadsorbable material, (4) desorbing with a material which is more strongly absorbed than the product n-paraffins, and (5) desorbing with an adsorbable material which is less strongly absorbed than the product n-paraffins. The desorption procedure used in the TSF process combines most of the better features of several of these desorption techniques and avoids most of

the disadvantageous aspects of each. The process basically employs vapor phase, displacement desorption using an adsorbable desorbing medium which is less strongly adsorbed by the sieve than the product n-paraffins. The advantages of the TSV desorption procedure over other methods of n-paraffin desorption are numerous, especially when processing kerosine or gas oil range materials. The most significant advantage is that n-paraffin desorption rates are maximized within economically feasible operating limits. Desorption rates are maximized by optimization of key operating variables including temperature, pressure, desorbing medium material, degree of desorption per cycle, and desorbing medium flow rate. Integration of this desorption technique with the other steps of the cycle results in a process which is relatively simple from an operational standpoint and which is capable of efficiently producing high purity n-paraffins from a variety of feedstocks.##

00567

J.A. Brink, Jr.; W.F. Burggraho, L.E. Greenvell

MIST REMOVAL FROM COMPRESSED GASES. Chem. Eng. Progr., 62(4):60-66, April 1966.

Fiber mist eliminators have been successfully used to purify gases and solve difficult air pollution problems involving: methanol synthesis gas, sulfonation and chlorination process gases, nitric acid process gases, chlorine, and compressed air. Extensive research and development work resulted in the development of fiber mist eliminators for the collection of submicron mist particles. The first plant-scale installations were made for the control of air pollution from sulfuric and phosphoric acid plants. After full-scale units had been proven highly efficient on mist gases containing submicron particles, further research was undertaken to develop fiber mist eliminators which would be most economical for the collection of particles which are predominantly 1 to 20 microns in diameter. The installation of fiber mist eliminators within various processes to purify gases was started after several difficult air pollution problems had been solved. The widespread application of fiber units to chlorine plants was reported in detail, but the applications to many other processes has not been reported previously. It should be noted that mists are present in many chemical processes at pressures ranging up to 5,500 lb./sq. in. gauge. The temperatures at which mists are present are usually moderate since many mists vaporize at higher temperatures.##

00936

Freeman, D. H., Jr. and R. E. Stahman

VEHICLE PERFORMANCE AND EXHAUST EMISSION, CARBURETION VERSUS TIMED FUEL INJECTION. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 42-59. 9 refs. (Presented at the SAE National Fuels and Lubricants Meeting, Tulsa, Okla., Nov. 2-4, 1965.)

vehicle performance and engine efficiency are evaluated from the point of view of carburetion versus gasoline injection. The author discusses measurement of combustion efficiency; mal distribution and fuel precipitation effects; how to determine mal distribution, heat rejection mixture strength and timing effects; exhaust gas composition and vehicle performance in road service; and octane requirement effects. (Authors' abstract)##

01197

L. Buhnke, E. Will, and P. Pederson

ELECTROHYDRODYNAMIC REMOVAL OF MICROORGANISMS FROM HYDROCARBON FUELS (FINAL REPT. JUNE 25, 1963 - NOV. 20, 1965). Litton Systems, Inc., Minneapolis, Minn.; Applied Science Div (AD-2905), Nov. 20, 1965. 139 pp.
CFSTI,DDC: AD 630 889

The feasibility of removing microorganisms and other particulates from hydrocarbon fuels by electrostatic precipitation was studied. Theoretic investigations describe the physics of electrohydrodynamic precipitation and essential parameters influencing collection efficiency. Measurements of fuel characteristics and filter parameters have been made which led to the development of an electrohydrodynamic filter. Particulates and a liquid are unipolarly charged in a corona edge ionizer and then are flushed into a precipitation tube in which particulates are moved by Coulomb forces into porous non-conducting walls. A 10-gpm model showed filter efficiencies of at least 85 percent by number of particles larger than 1 micron diameter. The basic advantages of the method investigated are the low pressure drop over the filter element and the small size of the unit. (Author abstract)##

01151

R.O. Engel C.D. Calnan

RESIN DERMATITIS IN A CAR FACTORY. Brit. J. Ind. Med. (London), Vol. 23:62-66, Jan. 1966.

An outbreak of dermatitis in a car assembly factory is described; it affected 50 workers who handled rubber weatherstrips coated with an adhesive. The adhesive was found to contain para-tertiary butyl phenol (P.T.B.P.) formaldehyde resin. Of those patch tested 70% gave positive reactions to the adhesive and 65% to the resin. Improved methods of handling and personal protection succeeded in arresting the occurrence of dermatitis. Barrier creams gave no protection in these circumstances. The episode illustrates the different preventive control methods which have to be tried when dealing with a simple skin hazard which cannot be abolished. (Author abstract)##

01011

H. C. Strahan and A. H. Rose, Jr.

EMISSIONS FROM CARBURETED AND TIMED PORT FUEL INJECTED ENGINES . J. Air Pollution Control Assoc. 15(1):15-18, Jan. 1965.

A popular make car was tested. Spark timing and fuel flow optimization was briefly studied. Performance and economy were compared between the fuel injected and carbureted versions. Emission measurements of CO, CO2, and hydrocarbon were made in road tests by proportional sampling and through the California cycle by continuous nondispersive infrared instrumentation. (Author abstract modified)##

01497

J. L. Blumenthal and R. Hobe

CATALYTIC COMBUSTION AND ADSORPTION KINETICS OF CARBON MONOXIDE ON CUPRIC OXIDE. Ind. Eng. Chem. Process Design Develop., 5(2):177-183, April 1966.

Studies have shown that cupric oxide-alumina is an effective catalyst for the complete oxidation of low concentrations of hydrocarbons and carbon monoxide. The catalytic combustion of hydrocarbons and CO is of interest in the control of the quality of automobile exhaust emission. The adsorption and oxidation of CO on 6 unsupported cupric oxide catalysts were studied. The adsorption of CO2 was also studied. The objective of the work was to determine the effect of different catalyst preparation methods on the adsorption and oxidation kinetics.##

01551

F. L. Collinson, C. Jones, and D. E. H. Lloyd

VENTILATION PROBLEMS ON RAPIDLY ADVANCING FACES, WITH SPECIAL REFERENCE TO THIN SEAMS. Mining Engr. (London), 125(71):785-792, Aug. 1966.

An assessment of ventilation problems in coal mining is presented. It is of particular interest today in view of increasing rates of production and the trend towards thinner seam sections. There is need to discover the relation between methane emission and coal output in varying circumstances. The assumption often made that gas emission is directly proportional to coal output may be a sufficient approximation for minor increases in output, but may be wide of the truth where output is doubled or trebled. The reasons for these variations are not known, but they must be related to the origin of the gas, particularly to the proportions coming from strata and from the solid and broken coal. Variations in air velocity over the cross-sectional area of the face affect the scouring of gas and the dispersal of dust. This is the type of information that must be obtained before it is possible to plan with any degree of accuracy the ventilation requirements of rapidly advancing faces and the means of providing such ventilation that the highest levels of output may be attained.##

01621

D.A. Jensen

STATUS REPORT ON COST FACTORS IN EXHAUST CONTROL (INFORMATIVE REPT. NO. 51). J. Air Pollution Control Control Assoc. 16, (10) 527-9, Oct. 1966.

The costs of devices for automotive exhaust control are estimated. The total costs paid by the customer are estimated based on factory installation. These systems include: (1) exhaust afterburners - flame type; (2) exhaust afterburners - catalytic type; (3) exhaust afterburners - limited mode type; (4) exhaust afterburners - non-flame type (manifold air); (5) deceleration devices; (6) engine modification.##

01645

A. J. Haagen-Smit

THE CONTROL OF AIR POLLUTION. Sci. Am. 210, (1) 25-31, Jan. 1964.

Using the development of Los Angeles' control program as an example, smog, dust, fumes, photochemical reactions, automotive emissions, control methods, emissions standards, and control devices are reviewed.##

01650

J.A. Holt R. Roesea

THE INFLUENCE OF INLET AIR CONDITIONS ON CARBURETOR METERING. Society of Automotive Engineers, Inc., New York, 1966. 13 pp. (Presented at the Congress of the Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1966, Paper 660119.)

This paper provides data concerning the enrichment of automotive carburetors with variation of inlet air pressure and temperature. These changes occur with weather and the season, with altitude, and because of underhood heating. The early opening of the conventional carburetor enrichment valve at altitude can add greatly to the "normal" carburetor enrichment. Means for compensating the mixture ratio for these changes in inlet air conditions are known, but will almost certainly add to the complexity and cost of the engine induction system. The cost of improved devices must be compromised with the possible reduction in exhaust emissions and improvement in fuel economy. (Author abstract)##

01651

E.E. Hoyeaan

CARCINOGENIC AROMATIC HYDROCARBONS IN AUTOMOBILE EFFLUENTS. Society of Automotive Engineers, Inc., New York also published in Vehicle Emissions (Selected SAE Papers) 6, 183-94, 1966. (Presented at Congress of the Society of Automotive Engineers, Detroit, Mich., Jan 8-12, 1962, Paper 620C.)

This paper is part of the joint effort by the General Motor Research Laboratories and the Simon-Kettering Institute to evaluate the contribution by automobiles to the trace amounts of carcinogenic hydrocarbons in the atmosphere. Benzene-soluble "tars", containing carcinogenic polynuclear aromatic hydrocarbons, is recovered from the total volume of exhaust and blowby gases

of an engine operated on a simulated city driving schedule. Fuel composition was found to influence both the pyrene, a carcinogen. Iso-octane and diisobutylene fuels gave only 20% as much "tar" as did a typical commercial gasoline, and a fuel comprised of equal volumes of ortho-xylene and benzene gave 70% as much "tar" as did gasoline. The emission rate of benzo(a)pyrene with diisobutylene fuel was only 7% of the rate with gasoline. Benzo(a)pyrene emission in blowby gas was less than 4% of the total benzo(a)pyrene emitted from the engine. On the assumption that benzo(a)pyrene from automobiles settles out of the air in the same manner as the lead from exhaust gas, automobiles may contribute, on the average, about 2% of the total benzo(a)pyrene in the air over cities. On the other hand, if benzo(a)pyrene is dispersed with little or no settling, as is the case for carbon monoxide from exhaust gas, the contribution of benzo(a)pyrene by automobiles may average about 10%. (Author abstract)**

01658

R.C. Reid, J.G. Mingle, W.H. Paul

OXIDES OF NITROGEN FROM AIR ADDED IN EXHAUST PORTS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 230-240. 6 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966. Paper 660115)

This paper presents the results of a study made to examine quantitatively the oxides of nitrogen in the exhaust of an internal combustion engine installed in a passenger car. The effects of adding secondary air to exhaust ports, with both a rich and lean carburetor, and for steady-state conditions, are reported. Experimental setup and procedures are explained. (Authors' abstract)**

01667

E.J. Springer, F. Lapinto, C. Wood

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE. Southwest Research Inst. San Antonio, Tex., Div. of Engines, Fuels, and Lubricants. (SwRI Proposal 10-4316A) Nov. 19, 1965. 46 pp.

This is a proposal from the Southwest Institute to assist the U.S. Public Health Service in setting reasonable, practical, and realistic smoke and odor standards for diesel powered vehicles. This assistance will involve obtaining additional basic data in the form of dilution ratios and operating conditions most conducive to the production of odor and smoke. A unable panel technique for measurement of odor will be developed as will chassis dynamometer procedures for evaluation and test of smoke and/or odor control devices. Various control devices will be evaluated using these chassis dynamometer methods and finally, fleet evaluation of the most promising control device(s) will be conducted.**

01671

E. Bartholomew

POTENTIALITIES OF EMISSION REDUCTION BY DESIGN OF INDUCTION SYSTEMS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1968, p. 192-211. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.) Also published as 90th Congress ("Air Pollution--1967, Part II (Air Quality Act)" Hearings before the Subcommittee on Air and Water Pollution of the Comittee on Public Works, U. S. Senate Feb. 8, Apr. 3-4, 1967, pp. 917-36.

As an alternative to oxidation of hydrocarbons and carbon monoxide in the exhaust system, a research program indicates that the volume of the combustibles discharged from the cylinders can be minimized by redesign of fuel-induction systems. The objective is achievable without lowering of the level of acceleration performance or increase of fuel consumption. A two-stage carburetion system is employed in combination with a dual or single manifold. The single-barrel primary stage of the carburetor, which is used alone in cruising up to about 70 miles per hour, provides good mixture preparation and close to uniform fuel distribution to the cylinders. The one or two barrels of the second stage are brought into operation when maximum performance is desired. Other features of carburetors and manifolds are described that contribute to emission reduction. (Author's abstract, modified)##

04112

J. Westchester.

PREVENTION OF AIR POLLUTION BY FUMES FROM BAKING FINISHES. Metal Finishing 64, (10) 702-77, Oct. 1966.

After reviewing regulations, particularly in Los Angeles County, for regulation of emission of organic solvents into the ambient air, the author lists critical solvents and their maximum permissible concentrations as established by the American Congress of Governmental Industrial Hygienists. He then goes on to review methods for disposing of waste solvents when finishes are baked on or cured at higher than room temperature. The most effective method is catalytic burning of the solvents; this method is employed in 2500 installations in the US and 1500 installations elsewhere. The disposal of chlorinated hydrocarbons and sulfur containing compounds in some cases and requires additional methods and equipment. Silicone coatings give off on combustion and coat the catalyst with a fine powder. The equipment for catalytic burning may be designed in several arrangements, but aerosol formation and condensation must be prevented before the vapors reach the exhaust fan, otherwise the efficiency of the catalyst may be impaired. Some installations recirculate the hot clean air resulting from solvent combustion to help bake the finish.##

02142

T. Tomioka

(POLICIES ON THE PREVENTION OF AIR POLLUTION DUE TO AUTOMOBILE EXHAUST GAS.) Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 4, (1) 11-5; 1966.

The toxic effects of exhaust gas components from internal combustion engines and possible means of control are reviewed. Types of engines mentioned are those fueled with gasoline, liquid petroleum gas and diesel fuel. Periodic inspection of vehicles for proper engine performance, improvement of roads and fuels, and equipping vehicles with supplementary devices for decreasing exhaust emissions are proposed as control methods. The filtering system required on 1966 model cars in California is explained. The principle of the infrared spectrophotometric analyser for carbon monoxide and hydrocarbons is discussed, and the apparatus described.##

02171

D.F. Rounds

A BIOLOGICAL ASSAY METHOD FOR MIXTURES OF HYDROCARBONS USING HUMAN CELLS IN TISSUE CULTURE. Preprint. (Presented at the Fifth Conference of Methods in Air Pollution Studies, California State Dept. of Public Health, Los Angeles, Calif., Jan. 31, and Feb. 1, 1963.)

It was observed that serial dilutions of hydrocarbons altered the growth rate of human fetal lung cells and an established line conjunctival elements. Growth reached a maximum rate when a chloroform extract of exhaust from an idling automobile was diluted to 0.005 of the stock concentration. The exhaust from the same automobile, after passing through a catalytic filter, showed a peak growth effect with a dilution of 0.025. From these data it was estimated that the exhaust device removed approximately 80% of biologically active hydrocarbons. Applications of the bioassay method to other problems are discussed. (Author summary)##

02405

AIR-GUARD SYSTEM FOR CONTROL OF EXHAUST EMISSION. American Motors Corp., Detroit, Mich. 1965. 11 pp.

American Motors' Air-Guard System for exhaust emission control was designed specifically to meet the State of California requirements which are based on its photochemical-type smog. In 1959, the California legislature enacted an addition of the Health and Safety Code called "Standards for Ambient Air and Motor Vehicle Exhaust." This legal requirement was adopted December 4, 1959. To meet the State's standards for exhaust emissions, the Air-Guard System was developed and designed to reduce the emission of hydrocarbons and carbon monoxide from the engine exhaust. All of American Motors' Six and V-8 engines are equipped

with the system. According to California law, 1966 model cars registered in the State must be equipped with an exhaust emission control system approved by the California Motor Vehicle Pollution Board. On July 14, 1965 the Board approved American Motors' Air-Guard System after determining that it meets all requirements under the California law. The purpose of this publication is to assist service operators to properly service and maintain the Air-Guard System in order to assure its optimum performance for controlling exhaust emission. (Author abstract)##

02411

EVAPORATIVE LOSS CONTROL DEVICE. Esso Research and Engineering Co., Linden, N.J. 1966. 11 pp.

The ELCD (an acronym for evaporative loss control device) is a development of the Esso Research and Engineering Company, Linden, New Jersey. Its function is to prevent the evaporative emissions of hydrocarbon fuel from automotive vehicles, an air pollution problem of growing significance. Based on a convehicles, an air pollution problem of growing significance. Based on a controlled adsorption-desorption cycle the ELCD traps those hydrocarbon vapors which would normally be lost to the atmosphere and later feeds them into the engine under controlled conditions such that they neither alter engine operation nor increase exhaust emissions of unburned hydrocarbons. A comprehensive treatment of the ELCD system and its components, the principles on which it operates, performance data on equipped cars (including evaporative control and exhaust emission analysis), the most current available information on life of this system and a design section which treats the flexibility inherent of the controlling parameters of this system, are described. (Author introduction)##

02442

G. R. Feyninger

A HYDROCARBON-AIR FUEL CELL USING AN ACID ELECTROLYTE. Army Engineer Research and Development Labs., Fort Belvoir, Va., Electrical Power Division. 11 pp., June 1966
CFSTI,DDC AD 636677

The utilization of liquid hydrocarbon fuels in a fuel cell to produce electrical power is of high practical interest. The ability to utilize the liquid hydrocarbon fractions available from conventional petroleum refineries at energy conversion efficiencies of 40-60% has the effect of greatly increasing the usable energy content of our proven petroleum resources. A new fuel cell concept which utilizes a phosphoric acid electrolyte offers a highly compact fuel cell assembly which can be used in a very highly simplified system for the generation of d. c. electrical power from hydrocarbon fuels. Either the hydrocarbon can be reacted directly at the electrodes in an anodic oxidation reaction or the active hydrogen of the hydrocarbon molecules can be liberated by a hydrocarbon-steam reforming reaction and the hydrogen subsequently reacted at the fuel cel anode. The objective of this paper is to describe the electrode processes involved in each of these alternatives and to discuss the

hydrocarbon-air fuel cell system which is now possible, based on the recent achievements from U.S. Army research investigations. (Author abstract)##

02474

G. Bergshoeff

IMPROVED ABSORBERS FOR SAMPLING AIR CONTAMINANTS. Intern. J. Air Water Pollution 10, (9) 629-31, Sept. 1966.

In a discussion on the Technical Note of SHARE (1965a) and the Letters to the Editor of NASH (1965) and MARTIN (1965) attention is drawn to a six-fold absorber with special pump-case, published by the author in the DUTCH CHEMISCH WEEKBLAD in 1961. The advantages of this absorber over that of SHARE (1965a) are discussed, and some suggestions for further improvement are given. (Author abstract)##

02541

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhales ou ingeres et des "nuisances" acoustiques. (Chapter 1: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problems scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la techerche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less never and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO_2, SO_3, and H_2SO_4 are related to the quanity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO_2 are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinach, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants

the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise.##

02600

N. V. Vanosheva, I. S. Mireeva, and N. N. Serzhantova

THE PROBLEM OF REMOVING THE CARCINOGENIC PROPERTIES OF BROWN COAL. (K voprosu o dekantserogenizatsii ugol'nykh briketov.) Hyg. Sanit. 29, (10) 11-6, Oct. 1964.
CFSTI: TT65-50021/10

3,4 benzpyrene was found to be present in coal pitch from various byproduct coke plants of the Ukraine, and in coal briquets in the production of which pitch was used a binding material. It was shown that the use of a smaller amount of pitch in briquet pressing did not markedly reduce the 3,4-benzpyrene content in briquets. 3,4-benzpyrene was likewise detected in the bitumen produced by Kherson oil refinery, however, its content in briquets made with addition of petroleum bitumen was several-fold lower than in briquets with pitch. Thermic treatment of briquets proved to be highly effective for decreasing benzpyrene content in the product. (Author abstract)##

02617

C. L. Goodacre

BRIEF SURVEY OF THE LITERATURE RELATING TO EXHAUST GAS CONTROL BY MEANS OF ENGINE MODIFICATION (PART III OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 65-78.

An appraisal is presented of published work on: air-fuel ratio; ignition timing; power output and speed; value overlap; combustion chamber deposits; manifold vacuum; carburetion; combustion chamber shape; engine cycle variations; spark plugs and electrical equipment; and pressure fuel systems.##

02638

H. A. C. Fosberry

EXHAUST SYSTEM DEVICES FOR PETROL-ENGINED VEHICLES (PART IV OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 75-93.

The major work on devices in exhaust systems has been on their use for the oxidation of hydrocarbons and carbon monoxide. A common feature of all these devices is that air is added to the

exhaust stream in order to allow combustion to take place; 3 methods of combustion are used, leading to 3 types of devices: Catalytic converters, Direct flame afterburners, and Manifold air oxidation systems. Devices on which results have been published have almost exclusively been related to the requirements of the Californian legislation for the control of exhaust emissions; thus it is convenient to discuss performance where possible in relation to the requirements laid down by California. These requirements are broadly that in 12,000 miles of normal driving the average emissions (as measured during a specified driving cycle carried out at intervals in the 12,000 mile test) should not exceed 275 ppm hydrocarbon (measured as hexane on a nondispersive infra-red gas analyser) and 1.5% carbon monoxide; certain criteria including ones on reliability, noise, odour and safety are also stipulated. Five devices (4 catalytic and one direct flame) have been approved by the Californian A.P.C.B. as meeting their requirements; brief details of these devices and of their performance in the California tests are given. A lesser amount of work has been published on the reduction of oxides of N in exhaust gases. The present relative status of the different devices is discussed.##

02698

R. Fuhn and R. Tosingas

ATTEMPTS TO PREVENT THE FORMATION OF POLLUTANTS IN THE EXHAUST GASES OF TWO-STROKE ENGINES AND DIESEL ENGINES BY ACTIVATING COMBUSTION WITHIN THE ENGINE. Staub (English Translation) 25 (1) 2-17, MAR. 1965.
CFSTI TT66-51044/1

Combustion in two-stroke Otto engines and the diesel engine can be influenced by chemical fuel additives in such a way that oxidation is catalysed and the side reactions of dehydrogenation and cyclisation are suppressed. In the two-stroke engine it was possible largely to reduce the formation of benzpyrene by using salts and chelates of polyvalent metals, in particular manganese, and to prevent it completely by means of ether and ether-like additives. For precipitation of the oil mists and soot particles the "adhesive oil method" was employed. In the experiments the two-stroke engine was selected first; checking of the results by experiments on four-stroke engines is in preparation. In the case of the diesel engine it has been possible to achieve a reduction in soot formation with overloading by 10 to 15%. (Author summary)##

02725

A. F. Banner and E. R. Tigentlits

DISPOSAL OF COAL TAR PITCH DISTILLATE OBTAINED FROM CARBON BAKING FURNACE BY CATALYTIC COMBUSTION. Preprint, J. Air Pollution Control Assoc. 13, (12) 610-2, Dec. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-39.)

The air pollution problems associated with coal tar pitch fumes evolved in the manufacture of baked carbon cannot be tolerated due

to odor of fumes which contain pyrene, phenanthrene, fluorene, chrysene and related aromatic compounds. Elimination of coal tar fumes was obtained by catalytic destruction at a temperature of 550 C. Complete destruction of aromatic compounds is realized with some unburnt free carbon discharged to the atmosphere. Choice of installation was based upon economics and ability to eliminate fumes. Preliminary data were obtained from work on a pilot unit. (Author abstract)##

02737

J. J. Keenan, R. B. Anderson, H. W. Swan, and L. J. E. Hofer

CHROMIUM CATALYSTS FOR OXIDIZING AUTOMOTIVE EXHAUST. J. Air Pollution Control Assoc. 14, (4) 113-7, Apr. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

The Bureau of Mines, in cooperation with the Public Health Service, Dept. of Health, Education and Welfare, has investigated the feasibility of using various metals and metal oxides as catalysts for the removal of the noxious components of automotive exhaust gases. The phase of this program reported here is the study of chromia-on-alumina catalysts for the oxidation of Co and hydrocarbons as represented by isopentane in a continuous flow system. Aqueous solutions of four compounds of Cr were tried as impregnating media for an alumina support to study their effect on physical and catalytic properties of the finished supported catalyst. Catalysts prepared from ammonium dichromate were considered to be superior to the other preparations on the basis of uniform dispersion of Cr within the support and on activity. Preparations containing 0.1, 2, 4, and 8 percent Cr were prepared and tested. The activity increased up to 4 percent with little or no improvement at 8 percent. Three-component catalysts containing in addition to chromia and alumina, small amounts of Co, Ag, Mn, Cu, and Fe were prepared and tested. Chromia-alumina catalysts containing Ag or Cu were more active than catalysts containing chromia-alumina alone in oxidizing Co at temperatures from 200 to 500 C; chromia-alumina catalysts containing Ag were more active in oxidizing isopentane. (Author abstract)##

02751

R. Lawrence, III, E. Klevier, L. A. Hipperton

THE EFFECT OF OPERATING VARIABLES ON AUTOMOTIVE HYDROCARBONS EMISSIONS. J. Air Pollution Control Assoc. 14, (5) 126-9, Apr. 1964.

The effect of varying engine load, air-fuel ratio, spark timing, and compression ratio on a blocked, single cylinder, gasoline engine was investigated with relationship to the production of unburned hydrocarbons in the exhaust gas. The study was conducted on a fully instrumented CFR engine. An increase in engine load caused no significant change in hydrocarbon emission. At the theoretical optimum air-fuel ratio the unburned hydrocarbons were at a minimum. Advancing the spark timing caused a decrease in the

hydrocarbon content. An increase in the compression ratio caused an increase in the exhaust gas hydrocarbon content. (Author abstract)##

02764

W.B. Rowe

RECOVERY OF ORGANIC SOLVENT FROM POLLUTED AIR. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-11.)

Many volatile organic solvents can be recovered profitably from the air in and exhausted from industrial plants by activated charcoal solvent recovery equipment. In some cases, the recovered solvents are of better quality than the original purchased material. Proper use of solvent recovery equipment can prevent air pollution, eliminate fire and health hazards, and reduce manufacturing costs. (Author abstract)##

02971

G. Schiessano

REDUCING THE EMISSION OF SMALL OIL-FIRING UNITS WITH SPECIAL EMPHASIS ON CONTROL METHODS. Staub (English Transl.) 25, (11) 2-10, NOV. 1965.
CFSTI TT 66-51040/11

In the case of small oil firing installations the type and concentration of emissions depend on the combustion process. Noxious effects are mainly caused by soot and aromatic hydrocarbons. Investigations into the possibility of reducing these emissions show that the most convenient solution of the problem is as complete a combustion of all combustible emission components as possible. Practical experience indicates that the present technical methods permit improvements to be achieved. Control methods used in heating operations are here of particular importance because of their effects on combustion. (Author summary)##

03165

W. P. Calvert

AN ABSORBENT FOR PROVIDING CLEAN AIR IN SUBMARINES. Navy Marine Engineering Lab., Annapolis, Md. (MEL Rept. No. 340/65). AUG. 1966. 18 PP.
CFSTI AD 639 583

The components to be removed from the foul air of a submarine atmosphere include moisture, CO2 and H2, each in a range up to about 1% by volume, and lesser quantities of contaminations which are off-gases from men and materials. These latter include the halogenated hydrocarbons, other hydrocarbons, CO, sulfur gases, nitrogen compounds, etc, which are in high concentration at their originating sources but may average to only a few parts per

sition in the total atmosphere. Occasional situations may occur when such larger quantities of these components enter a submarine's atmosphere. In addition it is necessary to remove certain airborne solids and liquids (i.e., dusts, smokes, aerosols, haze, bacteria, viruses, etc). Since adsorbents separate gases and vapors and filter airborne solid and liquid particles from a foul air stream, their capabilities are broadly inclusive. Cocoanut shell carbon is the adsorbent now widely used by the U. S. Navy for vents, filters, gas masks, etc. MS 544 is a sodium aluminosilicate adsorbent which, recently, became a commercial product. It is able to withstand thermal treatment in air during repeated activation to desired adsorbency status. It flows easily . An air purification process may need easy flowing adsorbent, this material is an example of the inorganic adsorbents presently available. Investigation of adsorbents included comparison of active carbon with an active inorganic adsorbent (MS 544) for the removal of Freon-11, Freon-12, CO_2, H_2, moisture, and background gases and vapors from prepared streams of "foul air." Adsorption, various desorptions, and heat activation were programmed in tests to compare the two adsorbents. Pressure decrease and clean air purge effects are included. It was concluded that (1) MS 544 is a safer adsorbent than carbon in a regenerative process and will remove more unwanted components from foul air, (2) termination of throughput in an air-purification adsorbent process is dependent upon the nature of the gaseous components which are to be removed from foul air; (3) moisture is a principal adsorbate in an airpurification adsorption process; (4) heating is necessary for rapid desorption and for complete activation prior to subsequent adsorption in a regenerative air-purification adsorption process.##

01266

G. C. Hass, D. B. Olson, J. H. Pattison, R. P. Sweeney, and R. Brubacher

THE EFFECT OF COMMERCIAL TUNEUPS ON AUTOMOTIVE EXHAUST EMISSIONS (PRELIMINARY REPT.). Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1961. 61-75 pp.

An exhaust test was conducted on the car as received. The car was sent out for tuneup and returned for the "after tuneup" exhaust test. The cars were then returned to the owners with specific instructions for them to observe their normal maintenance habits during the year. The cars are then to be brought back at intervals of 3, 6 and 12 months for exhaust testing only. The owners were also asked to keep a record of maintenance costs for a period of one year. One hundred vehicle owners not involved in the test program are also keeping a record of maintenance costs for one year to provide a comparison. Little, if any, improvement in average exhaust emissions can be accomplished by a conventional tuneup. Little, if any, improvement in average exhaust emissions can be accomplished by ordinary dealer tuneups with specific attention to items affecting emissions. If significant reductions in exhaust emissions are to be accomplished by engine maintenance, techniques and skills must be upgraded over current levels.##

01119

S. Calvert.

BASIC STUDY OF AIR POLLUTION CONTROL WET SCRUBBERS. (INTERIM PROGRESS REPT.) Pennsylvania State Univ., University Park, Center for Air Environment Studies. 260 pp. Sept. 1, 1966

The specific aims, method of procedure, and significance of the research are reviewed. Reprints of work reported since January 1964 are appended; their titles are: "Design of Baffled Conduit Particle Collectors" "Entrained Particle Collection in Packed Beds" "Particle Collection in Packed Beds" "A Technique for Determining Particle Penetration - Diameter Relationships" "Removal of Small Particles from Air by Foam" "Gas Sorption by Suspensions of Activated Carbon in Water" "Absorption by Bubblers in Series" "Sorption by Suspensions in a Sieve Plate Column" "Deposition of Particles from a Turbulent Stream by Thermal Force" "Deposition of Particles from a Turbulent Stream by means of Thermal Force" "Particle Collection in Secondary Flows" "Aerosol Sampling with a Wide Port Probe" Reprints of work reported before but published since 1964: "Gas Absorption in a Ribbon-Grid Column" "Mass Transfer in Horizontally Moving Stable Aqueous Foams" "Gas Absorption in a Fin-Wall Conduit" and "Experimental and Analytical Study of Plate-Type Gas Absorber Dynamics"##

01165

R. Kanz

DUST AS A GERM CARRIER IN WORKING ROOMS. STAUB (English Transl.) (Duesseldorf) 26, (8) 10-5, Aug. 1966.
CFSTI, TT 66-51159/8

The importance of dust containing germs in working places is discussed. In addition to sales rooms and other types of public places, various industrial establishments have dust problems. In particular, they are found in chemical plants where large-scale microbiological processing takes place, as in the production of citric and lactic acids; also this problem occurs in pharmaceutical plants producing antibiotics, and in packing and food plants. Hospitals also have to be concerned with controlling dusts. Four methods of air sterilization are discussed. These include UV heating ventilation, UV ceiling radiation, triethylene glycol evaporation and triethylene cold aerosol generation.##

01456

M. W. Jackson W. M. Wiese and J. T. Wentworth

THE INFLUENCE OF AIR-FUEL RATIO, SPARK TIMING AND COMBUSTION CHAMBER DEPOSITS ON EXHAUST HYDROCARBON EMISSIONS. General Motors Corp., Research Labs. 29 pp. (Presented during National Automobile Week, Detroit, Mich., Mar. 12-16, 1962.)

Investigations of air-fuel ratio and spark timing were carried out using: (1) a laboratory single-cylinder engine, (2) a passenger car operated at 30 mph road load (cruise) and (3) passenger cars operated in accordance with the conditions specified in the

California Standards for Motor Vehicle Exhaust Emissions. The study of combustion chamber deposits was limited to tests in a single-cylinder engine and in a passenger car operated according to the California Standards. Air-fuel ratio was found to have a significant effect on exhaust hydrocarbon emission. However, the problem of vehicle "surge," associated with leaner air-fuel ratios, may present a practical limitation to reductions that otherwise might be obtainable. Retarding the spark timing was generally found to reduce exhaust hydrocarbon emission in both a single-cylinder engine and in passenger cars. Reductions achieved by this method, however, will be accompanied by losses in fuel economy. The effects of leaning the air-fuel ratio and retarding the spark timing were additive when used in combination and consequently produced large reductions in exhaust hydrocarbon content. The fuel economy effects tend to offset each other when both methods of hydrocarbon reduction are used. The accumulation of combustion chamber deposits in both a single-cylinder engine and in a passenger car caused a significant increase in exhaust hydrocarbon content. The hydrocarbon emission measured by means of a nondispersive infrared analyzer sensitized to n-hexane was always less than the total emission measured with a flame-ionization analyzer. The ratios of the values obtained with the flame-ionization analyzer to those obtained with the infrared analyzer ranged from 1.5 to 5.5. Variations in air-fuel ratio had little effect on this ratio but retarding the spark timing caused it to increase markedly. This suggests that spark timing has a significant influence upon the type of hydrocarbons in exhaust.##

01536

AUTOMOTIVE AIR POLLUTION III. (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT.) Preprint, 1965.

Reduced exhaust emissions of hydrocarbons and CO have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fueled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase hydrocarbons and CO, particularly following cold-engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and CO emitted in exhaust gases. A survey being conducted to measure CO levels in urban communities suggests that human exposure to CO may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and CO, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution

and its control is indicated by the recent activities of technical associations. (Author summary)##

03665

S. J. Leach

VENTILATION OF ADVANCE HEADINGS. Colliery Eng. (London) 43(514):510-514, Dec. 1966.

Ventilation to remove methane from advance headings of mines is discussed; ventilation must dilute the methane to below 5%, its lower inflamable limit. The following points are discussed: (1) the "general body concentration" (concentration obtained when methane and air are completely mixed) given by other ventilating systems, (2) the systems giving the best mixing of methane emitted in and near the heading, (3) the means of restarting the fans if accidentally stopped and methane was accumulated, (4) the interaction of the advance heading ventilation with the main ventilation, and (5) the control of respirable dust. A discussion is also given on ventilation of roof layers where the volume of inflammable gas is greater than on walls or floor.##

03762

Spencer, H. F., Jr., M. Kayne, R. F. LeBus and J. R. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS (INTERIM REPT. NO. 2). Los Angeles County Air Pollution Control District, Calif. Jan. 1959. 40 pp.

This report discusses the equipment and procedures used in the evaluation of control equipment for solvent vapors from surface coating processes. A pilot plant which was used to recover organic solvents by means of activated carbon is described. Of the control methods evaluated, adsorption with activated carbon offers the greatest promise. The advantages of the activated carbon system are: (1) recovers solvent vapors in all concentrations below the flammable range; (2) recovers all types of volatile solvents; (3) recovers solvents efficiently in the presence of water vapor; (4) recovers solvent vapors with high overall efficiency; (5) operation of the equipment is simple; (6) the equipment is sufficiently flexible for all types of surface coating operations. Five complete adsorption-desorption cycles were completed. The adsorption efficiency before reaching saturation averaged 92 percent, while the desorption efficiency, based on solvent recovery vs. solvent adsorbed during the individual run, averaged 57 percent. Poor steam distribution is believed responsible for the incomplete desorption and the equipment is being modified to improve the stripping of the carbon. It is planned to investigate another fixed bed unit and one moving bed unit.##

01761

E. F. Spencer, Jr., N. Rayne, R. F. LeBuc, and J. H. Elliott

EXPERIMENTAL PROGRAM FOR THE CONTROL OF ORGANIC EMISSIONS FROM PROTECTIVE COATING OPERATIONS. Los Angeles County Air Pollution Control District, Calif. July 1959. 37 pp.

This report discusses the progress made in an experimental program designed to determine the degree to which the emission of solvent vapors from surface coating spraying operations can be controlled by adsorption with activated carbon. Twenty-two runs have been made to date with single solvents and multi-component solvent mixtures, representative of industrial formulations. The experimental work has shown that the control of organic emissions from surface coating operations by adsorption with activated carbon is technically feasible. Single solvents or combinations of solvents in low concentrations are adsorbed with high overall efficiency. Solvents immiscible with water are recovered with high efficiency. The desorption of mineral spirits appears to be the most formidable economic factor as the required desorption temperature is high and the value of the recovered solvent is low. A small experimental test oven to investigate surface coating oven emissions has been installed. Various surface coatings and resin products will be processed.##

01796

R. C. Stein, J. J. Feenan, G. P. Thompson, J. F. Shultz, L. J. E. Hofer, and R. B. Anderson

CATALYTIC OXIDATION OF HYDROCARBONS (AN APPROACH TO AIR POLLUTION CONTROL). Ind. Chem. Eng. 52, (8) 671-4, Aug. 1960. (Presented at the Division of Petroleum Chemistry, 135th Meeting Chemical Society, Boston, Mass., Apr. 1959.)

The hydrocarbons in the exhaust gases from automobile engines are a major source of the eye irritating smog occurring in urban areas. Catalytic oxidation applied where the pollutants originate in the individual vehicle is one of the methods of control. In a search for suitable catalyst components, a large number of metal oxides in granular form, unpromoted and unsupported, have been investigated by a new microcatalytic technique based on gas chromatography. The most active of the catalysts were, arranged in order of decreasing effectiveness, the oxides of cobalt, nickel, manganese, chromium, and iron. It is probable that different forms or preparations of the same oxide would have different activities. In general, the higher molecular weight hydrocarbons were more easily oxidized than the lower. Hydrocarbons of a given carbon number increased in reactivity according to the series : aromatic, branched paraffin, alicyclic, normal paraffin, olefinic acetylenic. Fortunately, the olefinic hydrocarbons generally considered the most undesirable are relatively easy to remove.##

01797

R. C. Stein, J. J. Feenan, L. J. E. Hofer, and R. B. Anderson

CATALYTIC OXIDATION OF HYDROCARBONS (TESTS OF SINGLE OXIDES AND SUPPORTED CATALYSTS IN A MICROCATALYTIC REACTOR). Bureau of Mines, Washington, D.C. (Bulletin 608.) 1963. 22 pp.

Pure oxides and catalysts supported on alumina were tested for activity in the oxidation of hydrocarbons in a microcatalytic reactor. The active components, oxides or metals, for oxidation of hydrocarbons were found in the transition series and in the lanthanide and actinide series. Partly completed d- or f-electron shells seem to be a criteria for high activity. The 10 most active elements in the 2 series of catalysts, in decreasing order of activity, were: (I) Single Oxides (Co,Mn,Ni,Cr,Fe,Ce, Ti,Th,Al,Cu); and (II) Supported Catalysts (Cr,Pd,Ru, Ag,Mn,V,Pt,Fe,U,Cu). The average reactivity of hydrocarbons in catalytic oxidation was found to decrease in the following order: 1-pentyne, n-hexane, 2-pentene, cyclohexane, n-pentane, 2,3-dimethylbutane, benzene, isopentane, and methane. Some catalysts were unusually effective in oxidizing particular hydrocarbons. The appendix presents data obtained by the same method for the catalytic oxidation of methane. The same general order of activity of catalysts was found in the oxidation of methane and C(5) and C(6) hydrocarbons. (Author summary modified) PP

03051

L. Raymond

ARIA POLLUTION AND THE AUTOMOBILE. L'Inquinamento Atmosferico e l'Automobile. Fumi Polveri (Milan) 6, (9) 235-45, Sept. 1956. Text in It.

The differences in air pollution between London (or New York) and Los Angeles are tabulated. The type of smog in London is due mainly to particulate matter in the atmosphere and is usually denser at night, while that of Los Angeles is due mainly to photosynthesis and photochemical reactions and is more frequent in the day time. The Department of Public Health of the state of California decided that a reduction of 90% of hydrocarbons and 60% of carbon oxides is necessary. The following rules to limit vehicular gas emissions are: hydrocarbons = 275 parts/million in volume (0.165 moles/100 atoms of carbon); carbon oxides = 1.5% in volume. The requirements of gas purification equipment should be the following: The equipment must be inexpensive and must function properly under diverse climatic conditions for at least 12,000 miles. It must be safe and well built and must not cause damage to the people. Gas must not be allowed to leak to the passengers. The noise level and the amount of gas consumed should not be higher than in similar cars that do not use such equipment. Various equipment of positive ventilation is illustrated, and methods to reduce gas emissions are described. PP

03054

E. E. Daniels, J. H. Lutz, L. A. Castler

POLLUTION CONTROL AT FERNDALE, WASHINGTON. Proc. Am. Petrol. Midyear Meeting, American Petroleum Inst. Division of

Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif., May 14, 1958.)

Pollution control at the Ferndale, Wash., refinery of the General Petroleum Corporation involves the design and operation of the various processes used to control liquid and air-borne wastes. Every opportunity is taken to regenerate alkaline solutions used in treating petroleum products, thus enabling reuse of these solutions and providing a further reduction in the load to the biological-oxidation units. When strong spent caustic and potassium cresylate treating solutions are no longer effective, they are enriched with the addition of excess hydrogen sulfide or cresylic acid, respectively, prior to sale. The use of stripped hydrogen sulfide gases in the spent caustic sulfiding tower has helped to reduce the quantity of this gas that has to be burned and, consequently, has reduced the emission of sulfur dioxide to the atmosphere. Floating-roof tanks are used extensively at the refinery to conserve hydrocarbons and reduce emissions to the atmosphere. The incineration and flare systems are discussed.##

03872

E. F. Kropp H. N. Sisemsen

SCRUBBING DEVICES FOR AIR POLLUTION CONTROL.
Paint Oil Chem. Rev. 115, (18) 11, 14, 16, July 3, 1952.
(Presented at the 45th Annual Meeting, Air Pollution and Smoke Prevention Association of America, Cleveland, Ohio, June 10, 1952.)

In cooperation with the municipal program, potential sources of air pollution from refinery operations were investigated. These investigations showed that, in the Sohio operations, there were three major sources of possible air pollution, as follows: 1. Acid Treating of Lubricating Oil Stocks; 2. Grease Manufacture; 3. Asphalt Manufacture. Experimental work with a pilot-model fog-filter type scrubber has established the utility of this type unit for absorption of fatty-acid odors, and sulfur dioxide and hydrogen sulfide from air streams containing these contaminants. Further work with units these contaminants. Further work with units of this general type may reveal other applications. As a result of this program, commercial units are being installed for the control of sulfur dioxide, hydrogen sulfide, and fatty-acid odors. Reducing the steam concentration of asphalt-oxidizer fumes by means of water sprays can increase the effective capacity of a fume system to dispose of asphalt fumes by combustion.##

03981

H. F. Hartmann, G. R. Brown, R. R. Kean

USE OF CHLORINE DIOXIDE TO REDUCE VAPOUR PHASE GUM IN TOWN GAS.
J. Inst. Fuel (London) 39, (307) 325-35, Aug. 1966.

Vapour phase gum, caused by the condensation of trace amounts of nitric oxide, oxygen, and diolefins has caused troublesome blockages of pilots and automatic control devices of gas appliances. This paper deals with the prevention of

minimizing of gas in the gas by oxidation of the nitric oxide by chlorine dioxide. It is shown that chlorine dioxide will oxidize 95% or more of the nitric oxide, in concentrations of up to at least 24 p.p.m. in less than two seconds, and that in favourable circumstances, gas formation will consequently be reduced to quantities too small to cause appliance complaints even though the reaction products are not removed. A considerable amount of control is necessary to make the process operate efficiently and successful application in any particular case will depend on the proper assessment of individual conditions. The protective measures outlined in the paper were instrumental in eliminating corrosion from the chlorine dioxide. (Author abstract modified)**

04013

F. H. Rhodes

PROJECT STRATOFIRE. S.A.E. (Soc. Automotive Engr.), Preprint. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

The reduction to practice of a stratified charge combustion system for automotive engines in the form of a bolt-on competitive product was attempted in 1960 and 1961, as part of an all-out company program aimed at smog elimination. The system and devices that resulted from this Walker Manufacturing Co. project showed promise as a fuel economy system, but in the end held little promise for smog reduction. Insights of Projects Stratofire that led to definition changes, theory modifications, and finally to the project cancellation are set forth. (Author abstract)**

04139

J. A. Renagy

DESIGNING A "CLEAN ROOM" FOR PLASTIC PROCESSING. Mod. Plastics 44, (3) 98-9, 171, Nov. 1966.

A solution to the problems of dust and fume control in a facility handling epoxides, polyesters, and polyurethanes is outlined. A room complying with Federal Standard 209 for a class 100 clean room with laminar down-flow was built to contain casting, encapsulating, and potting operations involving a variety of plastics, hardeners, and catalysts. Exposure to irritating and toxic materials, as well as the existence of a fire hazard in the use of epoxy systems cured with benzyl dimethylamine, polyester resin systems catalyzed by organic peroxides, and urethane systems were involved. The hazardous fumes are removed by the exhaust on the downdraft benches which discharges to the outside. The quantity of acetone, amine hardeners, peroxides, and other flammable or toxic materials is kept to a minimum in the room. A bank of five blowers recirculates the air from the space beneath the floor grating to a plenum chamber in the ceiling where the air is filtered before being returned through the ceiling. The air contains zero particles per cubic foot of 0.5 micron and larger. There is a pop-out escape door in addition to the regular door in case of fire.**

04179

E. Hostvik and O. Kralik

GAS REMOVAL FROM BITUMINOUS COAL PITS IN THE OSTRAVA-KARVINA DISTRICT. Czech. Heavy Ind. (Prague) 11, 14-6, 1966.

Degassing stations are used to remove gases from bituminous coal mines, especially in reducing methane exhalation by an average of 30 per cent. The reduced exhalation makes possible an improved venting of the pits, smaller air shafts, and thus reduced investment costs. The pits are also prepared for more rapid accessibility and for mass working. It becomes possible to use electric power on a wider scale and thus reduce the use of compressed air which is more expensive. The removal of mine gas is controlled and the possibility of its industrial utilization investigated. Absolute safety of operation of the degassing station is ensured by its perfect equipment with safety and control devices. (Author summary modified)##

04226

THE DESIGN AND DEVELOPMENT OF THE AIR PUMP FOR THE GENERAL MOTORS AIR INJECTION REACTOR SYSTEM. Gen. Motors Eng. J. 1966. pp. 30-5

The development of the General Motors Air Injection Reactor system for controlling the concentrations of unburned hydrocarbons and carbon monoxide in vehicle exhaust emissions required engine modifications and the design of new components. The most vital component in the system is the air pump, designed and manufactured by the Saginaw Steering Gear Division. The pump developed by Saginaw engineers is a semi-articulated vane type positive displacement pump. The design displacement is 19.3 cu in. per revolution with high volumetric efficiency and low horsepower consumption. Additional design criteria included durability consistent with the life of the vehicle and satisfactory performance without maintenance. (Author abstract)##

04279

S. T. Gadomski

DRY-PACKED BEDS FOR THE REMOVAL OF STRONG-ACID GASES FROM RECYCLED ATMOSPHERES. Naval Research Lab., Washington, D.C., Chemistry Division. (NRL Rept. No. 6399.) Aug. 30, 1966. 6 pp.
CFSTI, DDC: AD 642 274

Under certain conditions, strong-acid gases can be formed in recycled atmospheres by the combustion of halogenated hydrocarbons. One control measure involves the use of a dry absorbent filter. Li_2CO_3 has already been used as an absorbent in these filters as a result of a screening test of a number of scavenger materials. In this report the absorptive properties of some other potentially useful materials were assessed. Dolomite and soda lime were superior to Li_2CO_3 in air at 75 deg F and over 50% R.H., while the silica-alumina catalyst with monoethanolamine (MEA) impregnant and the silica-magnesia catalyst were almost as

effective as Li2CO3. However, Baralyme, soda lime, various basic materials (MEA, gaseous NH3, Na2CO3, and quinoline) supported on the silica-alumina catalyst, and the silica-magnesia catalyst were all useless at 140 deg F, especially under dry conditions. Li2CO3, therefore, still remains as the most effective absorbent throughout the range of probable conditions. (Author abstract)##

04157

R. Bauer

(COMBUSTION TRIANGLE FOR FLUE GASES FROM COMPOUND FURNACES.)
Das Verbrennungsdreieck fur Rauchgase aus Kombfeuerungen.
Brennstoff-Waerme-Kraft (Duesseldorf) 17, (5) 212-7, May 1965. Ger.

In order to utilize high value fuels, residues of production processes which are not sufficient for the power production needed, other fuels have to be used in addition and compound furnaces become necessary. These type furnaces are available for all sizes of steam generators and varied fuelds can be burned either individually or combined in one combustion chamber. If several combustion chambers are used, the flue gases, after the combustion process, flow combined through the rest of the boiler surface. However, incomplete combustion may result if flues of various characteristics are used. The flue gases have to be controlled and analysed by chemical or physical methods. For this analysis, a combustion diagram is of great value. The construction of such a diagram is discussed in the following equations: Equation of the enlarged combustion triangle by occurrence of hydrogen in the flue gas. Equation of the enlarged combustion triangle by occurrence of hydrogen in the flue gas. Equation of the enlarged combustion traingle by occurrence of loss of carbon. Equation of the enlarged combustion triangle by simultaneous occurrence of hydrogen in the flue gas and loss of carbon. nfluence of carbon loss on air proportion. Mixed (compound) fuels. Mathematical formulas are given for the construction of a combustion traingle.##

04179

K. Yamazaki and Nenryo Kyokaishi

EXHAUST CONTROLS FOR AIR POLLUTION. (J. Fuel Soc. Japan Tokyo) 44, (450) 565-74, Aug. 1965. Jap.

Principal differences in the burning mechanisms of premixed and diffusion flames are discussed in relation to carbon or soot formation in order to elucidate the nature of exhaust from gasoline or diesel engine vehicles. The contents of exhaust pollutants (carbon monoxide, nitrogen oxide, hydrocarbons and their incomplete combustion products) vary extensively according to the driving mode of vehicle operation, as in idling, acceleration, cruising and deceleration. It is important to note that hydrocarbon emission is extremely remarkable in the deceleration step. Diesel exhaust is rather clean compared to gasoline exhaust. Exhaust control devices, catalytic and afterburner, developed in America are briefly reviewed. Improvement of the

engine itself in order to reduce incomplete combustion is discussed. American estimations of future hydrocarbon emission under exhaust controls are cited. (Author summary)##

04617

AUTO EXHAUST STANDARDS WILL TIGHTEN. Chem. Eng. News 43, (20) 56-8, May 10, 1965.

Stricter standards regarding automobile exhausts are being sought, necessitating a more sophisticated approach to control systems by auto manufacturers. It is conjectured that controls based on reactive hydrocarbons, rather than total hydrocarbons, are likely. Many laboratories are presently assembling data on the reactivity of various hydrocarbons, but much more is needed. The continuing work on the modification of engines to reduce the emission of undesirable exhaust products is described. The need for standards regarding the emission of nitrogen oxides is controversial. However, research is proceeding on possible ways to control nitrogen oxides, concentrating primarily on catalytic systems. A diagram illustrating the formation of photochemical smog is included.##

04670I

R. H. Johns, R. P. Garvig, and R. Markels, Jr.

CATALYTIC COMBUSTION OF ATMOSPHERIC CONTAMINANTS IN SPACE VEHICLE ATMOSPHERES. Atlantic Research Corp., Alexandria, Va. May 1965. 70 pp.
DDC, AD 465 711

The general purpose was to study the kinetics of oxidation of various atmospheric contaminants by several catalysts. A differential rate method was utilized to determine a reaction rate that depended only on catalyst type and was therefore useful for comparing catalyst performance independent of reactor geometry. The oxidation of 0.1 per cent of methane and Freon 12 as contaminants in air was investigated. A reactor and gas preheater were devised which allowed precise temperature control. Hopcalite, palladium supported on alumina, vanadium pentoxide, and silver permanganate were the catalysts considered. Palladium was found to be more effective catalyst than Hopcalite for oxidizing methane. Palladium was also effective in oxidizing Freon 12, but the catalyst was poisoned with respect to further oxidation of methane. Differential rates at various temperatures up to 600 F were determined to compare catalyst performance. Neither vanadium pentoxide nor silver permanganate significantly oxidized methane at temperatures up to 600 F.##

04529

R. J. Everett, L. W. Brewer, G. W. Edwards, A. Juskiewicks, T. A. Linn, Jr., R. O. Mills, and A. J. Jack

INDUSTRIAL HYGIENE HANDBOOK. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab. (Rept. No. SC-RR-66-562.) Feb. 1965. 152 pp.

This handbook covers procedures, devices, and equipment for controlling possible occupational hazards at Sandia Corporation. Occupational hazards are usually divided into two general classifications: exposure to toxic chemical agents and exposure to physical agents or environmental factors. Chemical agents can enter the body by three methods: inhalation, skin contact, or ingestion. Inhalation and skin contact are the most important because the majority of occupational diseases result from inhalation of dusts, fumes, vapors, gases, and mists or from skin contact with chemical materials. Toxic materials, when inhaled, are frequently rapidly absorbed into the blood or into the fluids in the lungs. A classification of the chemical agents is given which is valuable for control purposes.##

04535

R. G. Woodland, R. C. Hall, and R. R. Russell

PROCESS FOR DISPOSAL OF CHLORINATED ORGANIC RESIDUES. J. Air Pollution Control Assoc. 15, (2) 56-8, Feb. 1965.

A continuous process for the disposal of halogen-containing organic residues has been developed. This process is based on the decomposition of wastes into gaseous byproducts by high temperature reactions with air and steam. The exit gases, which are essentially carbon dioxide, nitrogen, and hydrogen halides, can be scrubbed with water, thereby completely eliminating atmospheric pollution. A unique refractory-lined recuperative heat furnace has successfully operated in this fashion to dispose of more than 20 million pounds of liquid residues (average decomposition: 60% Cl2; 35% carbon; and the remainder oxygen, hydrogen, and others) during the last year. This process is cheaper than most conventional disposal methods (i.e., ground burial) and offers the added advantage of complete and permanent disposal. (Author abstract)##

04550

D. P. Thornton, Jr.

PLATINUM OXIDATION CATALYSTS IN THE CONTROL OF AIR POLLUTION. Platinum Metals Rev. 7, (3) 82-7, July 1963.

A description is given of the control of noxious products in waste gases by platinum catalysts. Platinum alloys are supported on specially prepared alloy steel ribbons, formed into mat-like beds of various sizes and shapes. Temperature required to initiate catalytic oxidation is discussed. Several typical applications are cited and schematics are included.##

04581

I. N. Khanin, V. I. Yakovlev, N. B. Kartsynel

A SPRAY-TYPE BENZOLE SCRUBBER WITH RADIALLY-SLOTTED GAS DISTRIBUTORS. Coke Chem. (USSR) (English Transl.) (1) 30-5, 1965. Russ. (7r.)

The aim was to present the results of a study of the aerodynamics of a new stage-type benzole scrubber with radially-slotted gas distributors. It has been found that: 1. The radially-slotted distributors distribute the stream quite evenly across the scrubber, irrespective of how the gas is supplied (radially alpha equals 0 degrees, along a secant alpha equal 35 degrees, or tangentially alpha equals 90 degrees); 2. Increasing the number of plates in the top and bottom rows of the distributors from 8 to 16 does not affect the distribution of the gas; 3. The gas distribution through the scrubber is impaired by increasing the depth of the slots between the two rows of plates. Although reducing the depth of the slots improves the distribution, it also increases the resistance of the scrubber; 4. The distribution of the gas improves noticeably as it passes through the distributors. There is no doubt that recovery improves as the number of distributors (and, consequently, the number of stages as well) increases; 5. Increasing the flow rate of the gas does not substantially affect the pattern of its distribution across the scrubber. However, the resultant increased turbulence of the gas jets emerging from the distributor slots improves the absorption; and 6. The resistance of a commercial stage-type scrubber with a gas throughput of 8&#270 cu m/h would be 51 mm water gauge. (Author conclusions modified)##

04610

B. S. Chittawadgi and A. N. Voinov

MECHANISM OF ACTION OF FERROCENE ON SMOKE REDUCTION IN DIFFUSION FLAMES. Indian J. Technol. (India) 3, (8) 209-11, July 1965.

The effect of addition of ferrocene on the smoke point (maximum height attained by a flame when a fuel burns in a standard lamp under standard conditions) of different fuels and on the formation and growth of carbon particles in a 240 mm diffusion flame was investigated. A standard smoke point apparatus was used, the method used being similar to the one recommended in British and Indian standards. The smoke points of the following fuels were determined: benzene, isooctane, isooctane-benzene mixture, diesel fuel (cetane No. 50) and gasoline A-72 (octane No. 68). The change in smoke point with different concentrations of ferrocene added to these fuels was determined also. Ferrocene increased the smoke point of gasolines and diesel oils appreciably. It reduces the size of carbon particles and increases their specific surface area. It has been suggested that ferrocene catalytically accelerates the rate of oxidation of carbon particles and thus reduces the smoke formation in diffusion flames.##

04628

V. V. L. Rao

DIESEL SMOKE. J. Inst. Engrs. (India) (Calcutta) 46, (1) 5-19, Sept. 1965.

This paper studies the feasibility of improving the combustion characteristics in a Diesel engine with a view to eliminate smoke, suppress noise and reduce the cost of operation and maintenance. Based on a study of the reaction kinetics of combustion and the associated problems, the effects of secondary fuel injection and fine vaporization on the elimination of smoke are analysed. The other features of combustion in a Diesel engine, e.g., augmentation of supply of air and its utilization, atomization, vapour formation, mixture distribution, provision of adequate velocity to the air, and construction of the combustion chamber, are also studied. (Author summary)

04659

POLLUTION BY EXHAUST: U.S. LAW AND A U.K. SYSTEM. Engineering (London) 203, (5260) 213-6, Feb. 10, 1967.

A British system for the control of toxic exhaust emissions which is inexpensive promises excellent results and minimum power loss. It is emphasised that California's problem with photochemical smog and the meteorological conditions which result in the continual recirculation of the air are extremely rare in Europe. Hydrocarbon monoxide is considered the more serious problem. There has been a suggestion that the Los Angeles atmosphere be analysed before and after a two-day ban on motor-cars to determine just how much pollution is caused by car exhaust. A very important contribution can be made by the Duplex induction system which employs a hot spot to assist vaporization in the manifold during part-throttle conditions only. The Zenith Duplex system vaporises the fuel in a by-pass or primary manifold during idling, part-throttle, and over-run when emissions are at a maximum. At the same time, the primary manifold is inoperative at full throttle, so maximum power is virtually unaffected. Charts are given representing the California regulations based on cold starting, idling, accelerating, and stopping to resemble normal city driving. A typical emission trace is given showing hydrocarbon emission from a standard 1200 cc engine during deceleration, acceleration, cruising, and idling. The emission with the Duplex induction system was 177 ppm of hydrocarbons with only a minor peak at maximum depression compared to 1610 ppm of hydrocarbons with severe peaks during deceleration.

04771

L. J. E. Hofer, F. Gunsey, and E. B. Anderson

SPECIFICITY OF CATALYSTS FOR THE OXIDATION OF CARBON MONOXIDE ETHYLENE MIXTURES. J. Catalysis 3, (1-6) 451-60, 1964. (Presented at the Catalysis Club Spring Symposium, Pittsburgh Pa., May 10, 1963.)

The specificity of 5 different catalysts for the oxidation of ethylene and carbon monoxide was determined in a microcatalytic reactor at temperatures from 50 to 600 C. On all 5 catalysts CO oxidized more readily than ethylene. Complete removal of CO occurred on the cobalt oxide at room temperature, on the copper oxide-chromium oxide on alumina catalyst at 100 C, on both copper oxide and iron oxide at 200 C, and on chromium oxide at 450 C. On cobalt oxide, iron oxide, chromium oxide, and the copper oxide-chromium oxide on alumina oxide the presence of CO enhanced the oxidation of ethylene. Conversely the presence of ethylene inhibits the oxidation of CO markedly in the case of cobalt oxide and iron oxide. Significant chemisorption at any temperature was not observed for chromium oxide or copper oxide. The other 3 catalysts showed significant quantities of chemisorption for both ethylene and CO. With chromium oxide, ferric oxide, and cobalt oxide, hydrogen was produced in amounts up to 2% of the hydrogen in the initial ethylene. (Author abstract)#

00618

R. D. Read

CONTROLLED ENDO-EXOTHERMIC OXIDATION OF INDUSTRIAL WASTES. Pre- (Presented at the Oklahoma State Univ. Conference on Industrial Wastes, Stillwater, Nov. 16, 1965.)

Time, temperature, and turbulence are factors in disposal by oxidation. The deciding factor for design temperature is the proximity of molecules of fuel to molecules of oxygen. Complete combustion, as defined by the author, does not exist if 500 ppm of the toxic or noxious material is in the flue gases. Average target concentration at grade and downwind of the stack is in the order of 0.10 ppm or perhaps less. The concentrations of substances which will cause odor nuisance are restated. The residence time factor must provide for the time interval required for conversion of the liquid to the gaseous state. In disposal of liquid streams and when mineral salts are present, the mineral exits from the furnace in the form of its oxide in sub-micron size particles.##

00656

E. E. Finfer

FUEL OIL ADDITIVES FOR CONTROLLING AIR CONTAMINANT EMISSIONS. J Air Pollution Control Assoc. 17, (1) 43-5, Jan. 1967.

An addition of additives to fuel oils prior to combustion is one way of reducing combustible contaminant emissions to the outer air. Reported test results show that some additives improve, moderately, the combustive properties of fuel oils. Combustion is also improved but to a lesser degree, in boiler systems that are deficient in operation and design. Being combustible, polynuclear hydrocarbons emissions would be reduced by use of additives. Other types of additives to reduce slagging and inhibit corrosion from combustion of fuel oils are also available. The cost of using additives is low. Improved additives are required, especially ones to better combustion in the deficient boiler systems. These can be found by research and literature surveys. Their effectiveness and nontoxicity would be confirmed by laboratory and field testing. (Author abstract)##

04671

W. R. Jones

THE ADSORPTION OF BENZENE VAPOUR FROM AN AIR STREAM, BY BEDS OF CHARCOAL. II. THE RATE-CONTROLLING MECHANISM. J. Appl. Chem. 15, 349-55, Dec. 1965.

The rate-controlling mechanisms discussed are: (i) mass transport of vapour in the air; (ii) an irreversible surface reaction, controlled by a thin, stagnant layer of air around the charcoal granules; (iii) a reversible surface reaction, also controlled by a thin layer of air; (iv) diffusion of vapour into the granules. In each case, a linear equilibrium adsorption isotherm of benzene vapour by charcoal is assumed. An electrical analogue of the obtained are discussed. It is concluded that diffusion of vapour into the granule as the rate-controlling mechanism, gives the best description of the observed results. (Author abstract)##

04672

W. R. Jones

THE ADSORPTION OF BENZENE VAPOUR FROM AN AIR STREAM, BY BEDS OF CHARCOAL. I. THE MOST EFFICIENT PHYSICAL ARRANGEMENT OF THE BED. J. Appl. Chem. 15, 345-9, Dec. 1965.

Air is often cleaned by passing contaminated air through a granular bed of an adsorbent such as charcoal. In such a situation the rate of flow of air is fixed and there is an upper limit to the physical size of the bed and an upper limit to the resistance of the bed to air-flow through it. The problem considered is the optimum size fo granule to be used in the bed and the optimum shape of the granule, leading to the longest life-time of the bed. An empirical answer to the problem is given for the uptake benzene by a BCRU steam-activated charcoal; apparatus, experiments and results used are described. The method of working and the conclusion are applicable to any vapour/solid system. (Author abstract)##

04688

R. J. Springer

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE (MONTHLY PROGRESS REPT. NO. 2, FEB. 28 - MAR. 15, 1967). Southwest Research Inst., San Antonio, Tex.; Vehicle Emissions Research Lab. Mar. 28, 1967. 16 pp.

Progress is reported on: catalytic muffler evaluation; engine derating; exhaust dilution and oxidation; Jacobs engine brake; fleet test of smoke suppressant; odor correlation chemistry; statistical analysis; and humidity control.##

04697

ARCO Chemical Co, Anaheim, Calif. Feb. 1967. 13 pp.

THE ATLANTIC RICHFIELD VEHICLE VAPOR RECOVERY SYSTEM.

The nature of the evaporation loss problem is briefly reviewed, and the control system developed for reducing these losses is described. All tank losses during vehicle operation are prevented by eliminating the vent and using a non-venting or one-way fill cap. The mixture of air and hydrocarbon vapor, normally vented from the tank, is ducted forward through a separate line to a condenser where any liquid condensable at ambient temperature is separated and returned to the tank. The uncondensed hydrocarbon plus the air flows from the top of the condenser to the crankcase ventilation system for induction into the engine where it is burned as air-fuel mixture. Any vapor which may come from the tank during the soak period is drawn into the crankcase by the slight vacuum which accompanies the decline in temperature. Vapor and excess liquid from the carburetor float bowl, resulting from boiling of the fuel or from afterfill during a soak, is skimmed from the bowl and ducted to the condenser for separation. The liquid flows to the fuel tank and the vapor to the crankcase by way of the crankcase ventilation system. Only one avenue is open to the atmosphere - the air cleaner - and the filter element partially impedes the escape route.##

04699

H. B. Daigh and W. F. Dester

CONTROL OF NITROGEN OXIDES IN AUTOMOTIVE EXHAUST. API [Am. Petrol. Inst.] Preprint. [Presented at a Session on Automobile Exhaust Gas, 27th Midyear Meeting, American Petroleum Inst., Division of Refining, San Francisco, Calif. May 17, 1962.]

Large differences exist in the concentration of nitrogen oxides in the exhausts from different makes and models of vehicles and for different modes of vehicle operation. Maximum quantities of nitrogen oxides are emitted during high-speed cruising with large incremental increases occurring for each 10-mph increase in speed. Full-throttle acceleration is another mode of operation which causes the emission of large quantities of nitrogen oxides. Nitrogen oxides can be reduced by several methods. Modification of ignition advance and carburetion and changes in fuel composition reduced emissions but did not achieve the 80-percent reduction which was the goal of this investigation. However, the use of recycled exhaust gas was effective, and reductions of 80 percent or more were generally obtained. A modified system for recycling exhaust gas was developed which offers an operable, inexpensive method for reducing emissions of nitrogen oxides. Adequate vehicle performance was achieved by recycling the exhaust at elevated temperatures and by designing the system to shut off the flow at idle and wide-open throttle. Concentrations of carbon monoxide and hydrocarbons (the latter during deceleration only) were also reduced. Limited testing with this system did not reveal any adverse operating effects or abnormal deposit problems. The results indicated that moderate changes can be made in the ignition and carburetion of those vehicles requiring such changes

with little sacrifice of nitrogen oxides reduction. Individual inert gases, such as nitrogen and carbon dioxide, were equally effective for reducing nitrogen oxides emissions. The effectiveness appears to be due to a modification of the combustion process resulting in lower peak temperatures. A thorough study of combustion should be made to identify those conditions influencing the combustion phenomenon and to determine the optimum conditions for reducing the concentrations of nitrogen oxides. (Author abstract)##

04962

R. G. Lunche, E. E. Leeke, E. L. Weiser, and J. A. Vernaen

AIR POLLUTION ENGINEERING IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. July 7, 1966. 51 pp.

Los Angeles County, the largest heavily-industrialized, semi-tropical area in the world, is afflicted with a serious and well-publicized air pollution problem. This problem is accentuated by average wind speeds of less than 6 miles per hr., and temperature inversions on more than 260 days per year, which restrict dispersion of the air contaminants generated by the activities of seven million people. Since 1939 population has more than doubled, industry has expanded from approximately 6000 establishments to more than 20,000 in 1966, and automobile registration, gasoline consumption and fuels usage have increased sharply. In addition to nearly two decades of expenditures by the District for research engineering and enforcement, industry has expended during this same period 127 million dollars for the installation of new control equipment units and 882 million dollars for basic production equipment. This progress is preventing some 5000 tons of various air contaminants from entering the Los Angeles atmosphere each day. Of this total, control measures of the petroleum industry are responsible for keeping some 3425 tons. The prohibition of burning of high sulfur fuels accounts for another 515 tons. The ban on single chamber incinerators and open burning prevents another 605 tons from entering the atmosphere. The control of air contaminants from mineral and metallurgical industries accounts for another 420 tons. Of the 5005 tons of various air contaminants now prevented from entering the Los Angeles atmosphere from stationary sources each day, 1195 tons are hydrocarbons, 1320 tons are SOx, 1945 tons are CO, 470 tons are aerosols, and 155 tons are oxides of nitrogen. The progress will not be complete however, until effective control over the gasoline-powered vehicle, fuel oil burning and organic solvent usage is carried out.##

05147

L. S. Caretto and R. Kobe

CATALYTIC COMBUSTION OF HYDROCARBONS WITH COPPER OXIDE. II. CYCLIC COMPOUNDS. California Univ., Los Angeles, Dept. of Engineering. (Rept. 63-8.) 1963. 59 pp.

In order to extend the study of the effects of chain length, saturation, and structure on catalytic combustion of hydrocarbons

applicable to catalytic afterburners for auto exhaust, kinetic behavior pertaining to copper oxide catalytic activity with cyclic compounds was investigated. The experimental apparatus consisted of a bench scale catalytic reactor and preheater with controls on flow and temperature and an electronic analyzer using a flame ionization detector to measure the hydrocarbon concentrations into and out of the reactor. Three compounds, benzene, cyclohexene, and cyclohexane were studied. The flow rates used ranged from 130 liters/hour to 600 liters/hour measured at room temperature. Initial concentrations used ranged from 190ppm to 2000ppm. The lowest temperature at which oxidation was measured was 195 C. The highest temperature used in the experiments was 360 C; at this temperature all compounds were greater than 90 % oxidized. The data were found to fit an apparent half order rate equation with activation energies of 29.0, 26.6, and 18.5 kcal/mole for benzene, cyclohexane, and cyclohexene, respectively. The relative positions of the oxidation rates of benzene and cyclohexane were approximately the same; the benzene being greater over the temperature range studied. The cyclohexene rate was initially greater than the benzene rate but as the temperature increased, it became less than the benzene oxidation rate. An error analysis indicated a lower limit was set to the range of conversion measurements by the increase of experimental errors at lower conversions. Diffusion calculations indicated that diffusion played a role at higher conversions. The derived kinetic equations neglected these points and should not be rigorously applied to higher conversions. (Author abstract modified)##

05149

W. F. Hamilton, H. Levine, and F. Simon

SMOG ABATEMENT. Lockheed Aircraft Corp., Burbank, Calif. (Dec. 1, 1959). 60 pp. (Rept. No. 19163.)

Techniques were developed for simulating typical smog polluted atmospheres. Methods and materials for reducing or preventing smog formation as measured by ozone level were studied. Several classes of materials were found effective in various degrees. Best results were obtained by direct addition of iodine to polluted atmospheres. Additions were effective both prior to smog generation by irradiation or after smog formation occurred. Attempts to introduce inhibiting materials in gasoline through an internal combustion engine were unsuccessful. (Author abstract modified)##

05155

W. Linville, and W. H. Parsons

A STUDY OF CRANKCASE VENTILATION SYSTEM CONTROL DEVICE INSTALLATIONS ON THE LOS ANGELES COUNTY FLEET. Los Angeles County Basin Pollution Control District, Calif. (June 1961). 83 pp.

Ninety-four vehicles were studied to determine cost, service life, and effect on the engine. During the nine-month period of the test, more than 1.5 million miles were run. Two basic types of crankcase ventilation system control devices were installed: the

Variable Orifice Metering Valve system, and the Direct Vent Tube System. Both devices functioned satisfactorily throughout the test period. The variable orifice metering valve systems accumulated 957,115 miles on 50 vehicles. No increase in maintenance or service costs resulted from the use of this system but the combustion chamber and induction system deposits were slightly greater than on similar vehicles not fitted with the crankcase ventilation system. The cost of the variable orifice system for new cars will be approximately $6 and for used cars from $11 to $15, including labor costs. No service life complaints were received on the variable orifice system. The direct tube to the air cleaner type of ventilating system accumulated 611,781 miles on 99 different vehicles. The increased maintenance or service costs resulted from the use of this system either, but here, too, the combustion chamber and induction system deposits were slightly greater than on the vehicles not fitted with a crankcase ventilation system. The original material cost for the direct tube system was approximately $1 per unit with the installation labor costs approximately $5. The direct vent tube system required no servicing throughout the period of the test. Crankcase ventilation control systems of either of the types tested effectively reduce the amount of hydrocarbon emitted from the crankcase; that original cost is moderate, reliability is excellent, and service expense is negligible; and, although deposits in the engine are increased slightly, the increase is not of a magnitude to increase measurably the cost of engine maintenance.##

05209

F. J. Woods, and J. E. Johnson

THE IGNITION AND COMBUSTION PROPERTIES OF ACTIVATED CARBON CONTAINING ADSORBED HYDROCARBONS . Naval Research Lab., Washington, D.C., Chemistry Div. July 20, 1964. 32 pp. (NRL Rept. No. 6090.)

Activated carbon contained in large filter beds is used in nuclear submarines for removal of odors and trace contaminants. Because organic vapors are concentrated in this way in the carbon, a study was made to get information for assessing the fire hazards involved in maintaining the carbon filter in the ventilation system of the submarines. In this study, spontaneous ignition of submarine-exposed carbons occurred at temperatures as low as 490 F in air at one atmosphere. Exothermic oxidative reactions occurred in a flow system at temperatures as low as 190 F. Combustion of carbons containing hydrocarbon produced considerable quantities of carbon dioxide and carbon monoxide, and significant amounts of these gases were evolved even under precombustion conditions. Of a number of carbons which had been used in submarines, the lowest flash point found was 150 F. (Author abstract)##

05210

Bureau of Mines, Washington, D. C. (Jan. 1963 98 pp.) (Rept. No. TID-8211.)

DEVELOPMENT OF DEPLETED-URANIUM CATALYSTS FOR DESTRUCTION OF AIR POLLUTANTS IN AUTOMOBILE EXHAUST (REPORT OF RESEARCH PROGRESS-FISCAL YEAR 1962).

catalysts were tested for oxidation activity in the continuous flow system. Four catalysts, all impregnated on alumina spheres, were active enough to oxidize isopentane from 0.2 percent concentration to below 0.01 percent at 600 C, in the presence of 2 percent carbon monoxide and 5 percent oxygen at an hourly space velocity of 10,000, (which corresponds to a reasonably sized muffler of 1/2 cubic foot volume for an average automobile.) Two catalysts were also active enough to oxidize the carbon monoxide content from 2 percent to 1.5 percent at temperatures below 900 C. A promoted uranium catalyst was shown to be effective in oxidizing automotive exhaust when used in a muffler of a 1/2-ton truck. With a nonleaded gasoline practically complete conversion of hydrocarbons and carbon monoxide was obtained during the idle portion of the cycle and fairly high conversions of the hydrocarbons were obtained while cruising at 30 mph. Carbon monoxide produced by the engine during the 30 mph cruise was less than 0.1 percent. At this low concentration, carbon monoxide was not oxidized by the catalyst. However, this quantity emitted to the atmosphere is not of significant pollutant value. In operating the engine under idle conditions from a cold start the temperature of the exhaust is insufficient to start and sustain catalytic activity. However, during the driving cycle the temperature of the exhaust leaving the engine is sufficient to maintain high catalytic activity. After reaching operating temperatures (600 C.) the catalytic reactor generates enough heat to operate effectively even at idle conditions for extended periods. With a leaded gasoline there was a gradual loss in catalytic activity. The efficiency of the catalyst in oxidizing hydrocarbons and carbon monoxide decreased by 21 percent over a period of 122 hours and 1,366 miles with the leaded gasoline (2 ml TEL/gallon). This rate of decline is excessive for commercial application. To retard the decline in activity, a replaceable zone of unimpregnated alumina spheres, located before the catalytic reactor, may be sufficient to remove most of the lead.##

052501

R. Hobe, and R. A. Accomazzo

CATALYTIC COMBUSTION OF HYDROCARBONS WITH COPPER OXIDE. I. Methane, Ethane, and Propane. California Univ.,Los Angeles, Dept. of Engineering. (Dept. No. 61-83.) Dec. 1961. 19 pp.

The catalytic combustion of hydrocarbons present in low concentrations is of particular interest in the search for methods to control air pollution. The results are reported of the heterogeneous oxidation of methane, ethane and propane with a CuO-Al2O3 (1:1) catalyst with a BET surface area of 120 sq m/gm and a mean pore radius of 65A. The combustion was studied at initial hydrocarbon concentrations in the range 650 to 5,000 p.p.m., in the temperature range 311 to 591 C and gas space velocities 6,000/hr. The hydrocarbon concentrations were measured with a Cesad flame ionization analyzer and detector. The experimental results showed that for gas space velocities up to 10,000/hr., 90% combustion was attained at temperatures above 580 C, 500 C and 480 C for methane, ethane and propane, respectively. The results indicated that the degree of hydrocarbon oxidation increased with increase in chain length. The experimental kinetic data was found to fit empirical rate equations which were one, three-fourths, and three-fifths order with respect to methane, ethane and propane concentrations respectively.

05300

Ludwick, J. B.

CHEMICAL ADDITIVES IN PETROLEUM FUELS; SOME USES AND ACTION MECHANISMS. J. Inst. Petrol. (London) 50, (491) 297-308, Nov. 1964. (Presented at the Northern Branch Symposium, Manchester, England, Apr. 23, 1964.)

The paper enumerates the types of anti-oxidants, copper deactivators, corrosion inhibitors, combustion chamber modifiers, anti-icing compounds, anti-knock agents, and anti-static additives in current use or proposed for use in the near future. Where possible the action mechanisms whereby these additives operate have been given and discussed. (Author summary)

05320

Grant, Eric P.

DO EXHAUST CONTROLS REALLY WORK? In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 13, Society of Automotive Engineers, Inc., N. Y. 1966, p. 291-296, 5 refs. (Presented at the SAE WEST Coast Meeting, Los Angeles, CALIF., Aug. 8-11, 1966.)

Descriptions of exhaust control systems used on 1966 vehicles are given. California Motor Vehicle Pollution Control Board (CMVPCB) is carrying out a surveillance program to gather data relative to the efficiency of these systems; exhaust emission results obtained on 1966 vehicles in cold- and hot-start tests are presented together with other data gathered. It was found that, based on emission tests of 900 vehicles in public use, average emissions of 800,000 1966-model cars and light trucks are within California standards of 275 ppm hydrocarbons and 1.5 percent carbon monoxide; emission levels in public use are higher than in proving ground testing; and 1966-model cars are 70 percent lower in exhaust emissions than existing cars.

05380

Knapp, H. E. U. Joachim, and G. Rausenn

THE INFLUENCE OF GASOLINE INJECTION ON THE EXHAUST GASES OF MOTOR VEHICLES. (Beeinflussung der Kraftfahrzeugabgase durch Benzineinspritzung.) Motortech. Z. (Stuttgart) 26, (9) 353-61, Sept. 1965 and Busch Tech. Ber. 7 (6), 206-20, (Sept. 1965). Ger. (Ti.)

The emission of carbon monoxide, hydrocarbons and oxides of nitrogen from various engines with intake-manifold fuel-injection systems, and in some cases from their carburetor equipped counterparts, was measured. Under steady running conditions, a fuel injection system offers advantages by making possible to adapt the characteristics from pair to pair to obtain the most favorable exhaust conditions. This adaption is described for both a mechanically and an electronically controlled injection system. Fundamental advantages are obtained with a fuel-injection system under non-steady running conditions, during acceleration and on the overrun. A great influence of engine design on hydrocarbon

emission is detectable. Gasoline intake manifold injection offers a sure way of meeting the current requirements of the California test of a CO content of 1.5 percent by volume. If the limit is going to be reduced to 1.0 percent as of 1970, as has been announced then it would seem possible to stay within this value through additional efforts. As shown in the examples of the small and the large engine, it is possible to fulfill the current hydrocarbon requirements of the test, provided the engine design takes into account the demands made on the exhaust gas. The NOX emission behaves exactly in an opposite fashion to the CO and hydrocarbon emissions, because it is at a maximum when the other components reach minimum values. At the present state of our knowledge it is not possible to influence this through the mixture. It is fortunate that the percentage of nitrogen oxides at low partial load values of the California cycle is low. In principle it makes more sense to provide maximum combustion completion for the fuel in the combustion chambers, rather than to install afterburners. Injection offers the additional advantage of smaller fuel consumption and larger rotational momentum.

05409

R. F. Bruttiord and J. L. McCarthy

OXBOW I: VOLATILE ORGANIC COMPOUNDS IN KRAFT PULP MILL EFFLUENT STREAMS. TAPPI 50, (2) 82-58 Feb. 1967.

As part of a program of development of a process for stripping aqueous effluents for kraft pulp mill odor reduction (OXBOW), a study has been made of the volatile organic compounds that may be steam-distilled from kraft pulp mill effluent liquors. Some compounds have been isolated and characterized by gas chromatography. The materials studied include an oil isolated from blow gas condensate, an aqueous blow gas condensate, and several crude sulfate turpentines. Compounds identified include hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyldisulfide, methanol, ethanol, acetone, methyl isobutyl ketone, alpha-pinene, beta-pinene, delta 3- carene, camphene, limonene, cineole, and alpha-terpineol. A large number of additional compounds have been detected. Turpentines from a number of sources have been analyzed and compared. (Authors' abstract) ##

05415

A. K. Ghosh, D. P. Rajvar, and D. Bhattacharyya

A MICRO-METHOD FOR RAPID TESTING OF CATALYSTS FOR THE OXIDATION OF COMBUSTIBLE GASES. Chem. Ind. (6), 255- 8 (Feb. 11, 1967).

The micro-method described is of particular use in cases where the catalyst should be tested quickly, precisely and with minute amount of the material. The oxidation of combustible gases (hydrogen, hydrocarbons, etc.) is carried out over catalyst deposited on a platinum wire-wound mica foil that may be heated electrically. An embedded thermo-couple measures the temperature at which the oxidation takes place as well as the extent of conversion. Provision for sampling of the oxidation products is also made for periodic analytical checks on the extent of conversion determined. Both the catalyst and the compensator are placed in

the flow duct in such a manner that the filaments do not lie directly in the main stream. Only the convection currents from the stream maintain steady supply of gas to the filaments. A set of aspirators and traps is employed for the supply of the gas freed from carbon dioxide and moisture. A calibration curve for methane oxidation is obtained initially by recording the maximum rise in temperature due to oxidation of methane-air mixtures of known composition. The curve is used for determining the degree of conversion of the oxidation reaction. The temperature of the filament is regulated by adjusting a suitable series resistance and carefully read by means of the potentiometer bridge. Methane-air mixture is passed at the rate of 200 cc. per minute. The degree of conversion is computed from the observed differential temperature rise and that in the calibration curve. As there is no need to analyse oxidation products in a separate apparatus, this method offers an advantage over other methods of rapid assessment. The observations of the oxidation temperature and of the corresponding extent of conversion take place almost simultaneously and the observed repeatability has been found to be fairly high.##

05471

J. Oliver

PAINT FINISHER AND AIR POLLUTION. Prod. Finishing (Cincinnati) pp. 52-9. Apr. 1967.

Rule 66 adopted by Los Angeles County, July 20, 1966 requiring tighter control of the 550 tons of solvent vapor discharged daily appears to be a precursor of regulatory action in other areas. The rule was based on smog chamber tests of the photochemical reactivity of various solvent vapors. Rule 66 prohibits the discharge of more than 15 pounds of organic material into the atmosphere daily from heat-cured, baked, or heat-polymerized material unless all organic material has been reduced 85% or to not more than 15 pounds daily. With air-drying finishes containing no photochemically reactive solvents there are no restrictions. Control measures include a greater use of water - based coatings and the substitution of a mixture of oxygenated solvents and aliphatic hydrocarbons for aromatic solvents. Where formulation changes do not control the exhausts from spray booths or baking ovens, alternative controls include absorption, liquid scrubbing, incineration, and catalytic combustion. Substantial tax benefits are under consideration in some states for companies installing pollution-abatement equipment.##

05537

Clarke, F. J., Gerrard, J. E., Akerstrom, C. W., Vardi J., Wade, D. F.

AN ADSORPTION REGENERATION APPROACH TO THE PROBLEM OF EVAPORATIVE CONTROL. Society of Automotive Engineers, Inc., New York. Preprint. (Presented at the Automotive Engineering Congress, Society of Automotive Engineers, Detroit, Mich., Jan. 9-13, 1967, Paper 670127.)

An approach to the containment of evaporative emissions of hydrocarbon fuel from automotive vehicles, using an adsorption system, is described. The concept of the system is based upon controlled adsorption-desorption cycling phased to engine operation modes. Feasibility is shown for both the containment of hydrocarbon vapors which would normally be lost to the atmosphere, and the feeding of these vapors to the engine under conditions such that both exhaust emissions and engine operation are unaltered. Extensive performance data are furnished on three cars equipped with exhaust control devices, and system design is treated in a semiempirical fashion demonstrating the flexibility of the approach. (Author abstract)

05742

Middleton, J. T.

CRITERIA FOR CERTIFICATION OF MOTOR VEHICLE POLLUTION CONTROL DEVICES IN CALIFORNIA. J. Air Pollution Control Assoc. 13 (2), 78-80 (Feb. 1963). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

It is the purpose of this paper to give the criteria for the acceptance of devices and present some of the data used in establishing them. It is presently estimated that crankcase emission control systems are installed on about 10 percent of the state's eight million motor vehicles and thereby effect a 2 1/2 percent reduction in hydrocarbon emissions. This small but significant beginning in returning clean air to California will be greatly increased with the mandatory installation of crankcase devices on used cars, trucks, and buses.

05823

A. C. Stern

PROSPECTS FOR EXHAUST CONTROL BY ENGINE MODIFICATION, Preprint. (Presented at the Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif.; Dec. 7, 1961.)

Automotive research is much needed on internal combustion engines designed to reduce pollution emissions from their operation. If progress is to be made toward the smog-free automobile, a new sense of mission and a lot more fiscal support has to be given and competent researchers have to be encouraged to undertake the work. Although we cannot predict the results of research, the several possible approaches which are available lead one to be optimistic as to the probability of achieving reduction in exhaust emissions by engine design modifications.##

05834

P. L. Hartley, C. C. Moore, and J. B. Gregory

THE SMOGLESS AUTOMOBILE. (J. Air Pollution Control Assoc.) 10 (4) 181-5 (Sept. 1960). (Presented at the 52nd

Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 22-26, 1959.)

Recent studies show that losses from the carburetor float bowl and the fuel tank are significant and can amount to 20 to 30% of the total hydrocarbons emitted from cars in the Los Angeles Basin. The purpose was to show how current fuel systems may be changed to effectively reduce, if not virtually eliminate, these losses. Automobiles with intentionally plugged external vents were operated at altitude and low altitude, employing winter and summer gasolines, and running under mild, and hot weather conditions. No complaints were received from any of the drivers that plugging the external vent has interfered with normal car operation. A drain-back system was installed which empties the contents of the carburetor bowl into the fuel tank immediately when the engine is turned off. This system is fitted with a vacuum-operated valve which is closed while the engine is running so that warm gasoline from the carburetor bowl is not continuously circulated to the tank. The drain time of the carburetor bowl is approximately one minute. During this drain time some fuel does evaporate but our experiments show that hot soak losses are reduced by 95%. The fuel tank was insulated with two sheets of asbestos paper, a sheet of aluminum foil, and a final layer of asbestos cloth. On the average, losses from the insulated tank are reduced by about 70%. A vacuum-actuated valve was installed which closes the fuel tank vent during engine operation. By combining both insulation and fuel tank vent closure, fuel tank losses are reduced by about 90%. A fuel tank cap is provided which acts both as a pop-off valve in the event pressure exceeds two pounds within the tank and also as a vacuum breaker which allows air to go into the tank as it is required. A vacuum reservoir acts as a delay mechanism in opening the drain-back valve. A fuel pressure regulator protects the float bowl.##

05859

E. S. Deckert, R. G. Lunche, and R. C. Murray

CONTROL OF VAPORS FROM BULK GASOLINE LOADING. J. Air Pollution Control Association. 8(3):221-7, 230-3 (Nov. 1958). (Presented at the 50th Annual Meeting, Air Pollution Control Association, St. Louis, Mo., June 2-6, 1957.)

An intensive development program by the petroleum industry has succeeded in producing equipment capable of collecting and dispersing of the hydrocarbon vapors displaced during the bulk loading of gasoline into tank vehicles. Refinements to the various types of loading arm assemblies have overcome the problems posed by tank settling during loading and liquid drainage from the loading spout after loading, as well as eliminating "open topping". Inasmuch as equipment manufacturers have been involved in the development program, the equipment items comprising a control system are commercially available. Where the loading into tank vehicles is performed near existing vapor recovery facilities (or gathering lines) absorption plants or fuel gas systems, they can be used to dispose of the vapors. At other locations, such as bulk terminals or bulk plants, where such facilities do not exist, a separate package-type disposal system has been devised. This latter system employs absorption of the displaced vapors in liquid gasoline at about 200 lbs. pressure to recover all but a few per cent of the displaced hydrocarbon vapors. Each of the described

types of control equipment has been installed and in operation for nearly a year and each has proven workable and effective. A systematic program of maintenance should guarantee continued usage without excessive costs. Hydrocarbon vapor emissions have been reduced by about 30 tons daily. These controls represent investments of approximately three million dollars by the petroleum industry and payouts are estimated at thirty months to five years.##

05099

D. S. Mehta S. Calvert

GAS SORPTION BY SUSPENSIONS OF ACTIVATED CARBON IN WATER. Environ. Sci. Technol. 1 (9), 725-31 (Apr. 1967). (Presented at the Symposium on Industrial Air Pollution Control, 59th Annual Meeting, American Inst. of Chemical Engineers, Detroit, Mich., Dec. 4-8, 1966).

The objective of this research was to study and analyze the process of mass transfer as applied to gas sorption by suspension of absorbent particles in liquid. Major factors of interest in this study are equilibrium relationships and rates of transfer. In gas transfer to suspension of absorbent particles the solute gas first dissolves in the absorbent and from liquid it is absorbed by the absorbent particles. Thus, there are transport steps from gas to interface, through liquid, from liquid to solid, and through solid. It is necessary that there be a useful adsorption capacity on the wet solid, but high equilibrium capacity does not necessarily ensure high rates. The rates and the factors affecting rates must be investigated. It has been shown that the controlling factor, for the rates of transfer to suspensions, is the solubility of the solute gas in water. The results of the study suggest that the overall efficiency of the system for sorption by suspensions can not be greater than the intrinsic efficiency of the system for physical absorption of the compound under the same hydrodynamic conditions. The solubility of benzene, toluene, and trichloroethylene in water were determined at 25 C. The absorption isotherm of CO2 on wet Nuchar C-190 was determined in the range of 0 to 0.003 atm at 25 C. The absorption capacity of water can be increased to a great extent by addition of an adsorbent. In the presence of 2% (by wt.) activated carbon, the capacity of water increases by 0.2 times for CO2, by 21 times for propane, and by 192 times for butane at 1 atm. pressure and 10 C. The overall efficiency for sorption goes through a maximum with the increase of activated carbon concentration. The increase is explained by a mathematical model for the rates of transfer and the decrease is suggested to be due to hydrodynamic factors. Suspensions would give a high overall efficiency in a practical contactor for compounds with high intrinsic efficiency for physical absorption.##

05029

W. G. Tyler

CATALYTIC OXIDATION OF ODOROUS IND SOLVENT VAPORS. (Proc. Tech. Conference, Mid-Atlantic States Sect., Air Pollution Control Assoc., Newark, N.J.,) 1-7 (1962).

This article reports the engineering approach to the development of controls for fumes emitted during high speed printing operations. It was found that the kerosene-like solvent used was being partially oxidized to irritating and obnoxious aldehydes by the severe drying conditions, i.e., hot circulating air blast of 650 - 700 F. After pilot plant runs to test catalytic oxidation, it was concluded that 30 to 80% of the recirculated solvent vapors were oxidized to objectionable materials without a catalyst being present, and with one present, 90 to 95% of the solvent vapors being recirculated were converted to unobjectionable CO2 and water. With this encouraging information, the Pt catalyst installation was made. A second installation provided a six deep catalyst bed of half the original cross sectional area. This not only evened out the flow across the bed but appeared to improve efficiency as evidenced by increased temperature rise across the catalyst. Location of the catalyst in the circulating systems has the disadvantage of using about 4 times as much catalyst as would be required in the stacks with their much smaller fans. This disadvantage is more than compensated by the simplicity of operation and the fuel gas economy. Catalytic oxidation not only reduces the partly oxidized hydrocarbons discharged but also the amount of tar formed in process.##

65966

G. T. Tuster, P. Staudhammer, H. Huber, and E. H. Heinert

EXHAUST CONTROL DEVICES: AN INVESTIGATION OF NON-CATALYTIC AFTERBURNING. (In: First report of air pollution studies.) (California Univ., Los Angeles, Dept. of Engineering.) (Dept. No. 55-27.) (July 1955). 81 pp.

A non-catalytic afterburner was designed and tested on a 1941 Plymouth-6 engine. The afterburner was designed to provide a favorable reaction zone for the completion of the oxidation of hydrocarbons in the exhaust. High temperatures were maintained in the afterburner by minimizing the heat losses; and surfaces were provided on which the oxidation resistant materials, such as ketones, could be oxidized. Secondary air, preheated in a heat exchanger, was introduced into the afterburner to insure the presence of adequate oxygen. While the extent to which the combustion can be completed in the afterburner is dependent upon many factors, the temperature of the reacting gases is the most important variable. This temperature, unfortunately, is mainly controlled by the engine characteristics and load. A power output of 15 hp was required in order to produce a high enough exhaust gas temperature (1170 F) for the afterburner to reduce the hydrocarbon concentrations in the exhaust stream from 600 ppm to less than 20 ppm. The surface provided by packing the afterburner chamber with spherical silicate pebbles was found to promote the combustion process. The packing in this form, however, was impractical because of its high heat capacity and attendant long warm-up period. A porous plate which combines favorable surface effects with a short thermal time constant was being considered. An equation describing the behavior of the afterburner was derived in which two constants had to be evaluated experimentally. This equation was found to correlate satisfactorily the experimental results. By means of this semi-empirical relationship, the performance of this particular afterburner when coupled to any engine can be calculated if the engine characteristics are known. (Author summary modified)##

06049

EFFECTIVENESS OF EXHAUST CONTROLS OF 1966 VEHICLES BY THE STATE OF CALIFORNIA MOTOR VEHICLE POLLUTION CONTROL BOARD, AUG. 10, 1966. 90th Congress, pp 275-80. ("Air Pollution-1967, part 1 (Automotive Air Pollution)" Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, Feb. 13-14, 20-21, 1967.

Based on emission tests of 604 vehicles in public use, the average emissions of the 800,000 1966-model cars and light trucks are within the California standards of 275 parts per million hydrocarbons and 1.5 percent carbon monoxide. Emission levels in public use are higher than in proving ground testing. This means that the 1966-model cars are approximately 70% lower in exhaust emissions than the existing car population. There is a very wide range of emissions (at least five to one) between individual cars, even with new exhaust systems. Available data indicate that there may be emission deterioration as mileage accumulates with the exhaust control systems in public use. 150 private owners of 1966 cars with exhaust control systems and 65 owners of 1965 cars without exhaust control systems have been interviewed with regard to the driveability of their cars. Slightly less satisfaction with driveability was indicated on 1966 models compared to 1965. However, some takes made substantial improvements in satisfaction with certain driveability characteristics. Exhaust emission control is sensitive to proper adjustment and proper servicing of the engine and control system. Driveability also is affected by proper engine adjustment. The vehicle manufacturers and car dealers have done a good job of training mechanics regarding the exhaust control systems. However, results on the 1966 models indicate that many engines are maladjusted. Efforts should be redoubled to develop better approaches to vehicle service.##

06127

Hess, H. and R. Stuckel

RUSS-FREE COMBUSTION OF PETROCHEMICAL WASTE GASES. Zur Russfreien Verbrennung Petrochemischer Abgase. Chem. Ingr. Tech. (Weinheim) 39, (5-6) 334-40, Mar. 20, 1967. Ger.

If soot formation is to be avoided in the combustion of petrochemical waste gases, the flame must be supplied with sufficient oxygen in a mixture of steam and air. The equations of reaction (water gas process) and heat content are set up and solved by an iterative digital computer method. The results were experimentally checked with a turbulent acetylene flame. Concentrations and flow velocity were measured for the onset of luminosity and generation of soot. Large flow velocities ensure good mixing with the surrounding air, thereby reducing the required quantities of steam. For economic reasons it is therefore desirable to work with high-velocity flames, but the stability of the flame and the noise generated by it set practical limits. The numerical results of the theoretical and experimental investigations are represented in 11 diagrams as well as in three schematics for suggested designs for burners.

06148

Hirao, O.

PROBLEMS OF AIR POLLUTION DUE TO VEHICLE EMISSIONS GASES. J. Japan Soc. Mech. Engrs. (Tokyo) 69,575, 1568-72, Dec. 1966. Jap.

The reduction of air pollution due to automotive exhaust is estimated to cost the Japanese tax payer $42 million. Likewise, a great expense will be incurred in protecting pollution from steam power plants. Automobile exhaust causes pollution in local areas such as heavy traffic circles. The harmful effects of such pollutants as CO, SO_2, NO, hydrocarbonds, formaldehyde, and dusts are discussed, especially pollution due to CO. A supplement of secondary air to convert CO to CO_2, and the even distribution of gases to the cylinders would be useful in cutting pollution. The production of various hydrocarbons by the engine is tabulated. Another possible method for lessening the concentration of automotive emissions would be in construction of over- and under-passes to avoid bottlenecks on the highway. This method would be cheaper than design and installation of engine modifications for each car. For example, it is estimated that it would cost $900 million per year for cars in the United States to be properly equipped to control automotive emissions, which money could more favorably be used in carefully designed construction of 3000 miles of highway.

06159

G. C. Patterson

PRESSURE RELIEF AND BLOWDOWN: FUNDAMENTALS OF ENGINEERING OPERATING AND UTILITIES FOR THE NPI (PART 6). Petro/Chem Engr. 39, (6) 51-4, 56, 58, May 1967.

The provisions to dispose of the vapors and liquids discharged by various pressure-relieving devices such as safety and relief valves, rupture disks, pressure-control valves, and furnace emergency blow-down valves are outlined. In the open systems, the vapors and liquids are permitted to discharge directly to the atmosphere, primarily within the process unit. In the closed system, the vapors or liquids are discharged to a flare, burning pit, or blowdown drum and are used especially with offsite facilities. Hydrocarbons with a molecular weight greater than 80 are usually discharged to a water-quenched blowdown drum. Hydrocarbons having a molecular weight of less than 80 which are discharged on a continuous basis are usually discharge through a closed system to a flare or burning pit. Hydrocarbons having a molecular weight of less than 80 which are discharged intermittently from relief valves or rupture discs are discharged directly to the atmosphere except where restricted by local ordinances or where there is a hazard of explosives concentrations at ground level. Where smokeless flares are required, one method is to induce greater air flow by a series of steam jets giving a flame which is invisible in the daytime. Water-quench blowdown tanks provide a facility in which hot liquids can be cooled prior to ultimate disposal. A blowdown drum and vent can be used for liquid hydrocarbons which are not expected to vaporize appreciably. The method of disposal varies with the hazard.##

06170

Rencher, S. R.

CHANGE YOUR PROCESS TO ALLEVIATE YOUR POLLUTION PROBLEM. Petro/Chem. Engr. 39, (6) 21-4, May 1967.

The waste disposal problems involved in the production of olefins by thermal cracking of hydrocarbons are reviewed as illustrative of the sophisticated development of by-product usage by the petrochemical industry and the solution of waste disposal problems by economically sound methods. Both air and water pollution are covered because of their close relationship. The loss of hydrocarbons from a 500 million lb/yr ethylene plant has been calculated as 10,410 lb/day or 0.21 percent loss on the plant feed. The techniques to maintain a low level of hydrocarbon emissions include: floating roof tanks to control evaporation loss; vapor recovery lines to vents of vessels that are continually filled and emptied; manifolding of purge lines used for startups and shutdowns to vapor recovery systems or to the flare system; venting of vacuum jet exhaust lines to recovery systems; shipments by pipeline rather than by car or truck; covering of waste water separators; and the use of flare stacks which operate with steam or air injection to obtain smokeless combustion. The H_2S should be extracted from sour gas streams with a suitable solvent. With large quantities of H_2S it might be advisable to extract the H_2S for eventual sulfur recovery. The mercaptans are converted by various sweetening processes into odorless disulfides. The mercaptans can also be stripped from the caustic solutions used for their absorption by steam, flue gas, or air. Flue gas stripping converts the mercaptans chemically and the solution can then be severed.

06221

THE COLLECTION OF TRICHLOROETHYLENE AND PERCHLOROETHYLENE VAPORS. La Captation des Vapeurs de Tri et de per. (Italiano (Paris))) 36, (361) 123, 125-6, 1h3, Feb. 1967. 9r.

The collection of solvent vapors such as Trichloromethylene and perchloromethylene from the atmosphere of work areas is required to prevent the contamination of the air and to make the operation an economical one by reducing the cost of degreasing. The classical methods used are based on the condensation of the vapors on pipes in which cold water is circulated or by adsorption on activated charcoal. In some cases a combination of the two methods is used. The method used depends on the concentration of the solvent in air, the temperature and pressure of the solvent, eventual contamination of the solvent, the degree of recovery desired, and the limitations imposed by the equipment. Condensation is practical only in high concentrations of vapor where complete removal of the solvent from the air is not required. In the use of activated charcoal it is necessary to reverse the process by vaporizing the collected vapor with steam for recovery and to permit the reuse of the charcoal. It is also possible to recover some solvents by percolation of liquids from decanting operations through activated charcoal.##

06291

J. Rousseau

ATMOSPHERIC CONTROL SYSTEMS FOR SPACE VEHICLES. (Air Research Manufacturing Co., Los Angeles, Calif.,) 260p., Mar. 1963. (Technical Documentary Rept. No. ASD-TDR-62-527, Part I.) (Contract No. AF 33(616)-8323.) (Project No. 6146.) (Task No. 614609.)

The studies performed on gas supply subsystems have shown that supercritical storage of atmospheric constituents is preferable to other storage methods. Cabin humidity control by the cooler-condenser process, with subsequent liquid water separation, seems to be the only suitable method of water removal at present. The choice of a carbon dioxide management subsystem is essentially based on the vehicle mission duration. For short-duration missions, lithium hydroxide appears the only attractive chemical means of carbon dioxide control. Depending on the design cabin conditions, carbon dioxide removal by freeze-out technique is definitely applicable to missions shorter than two weeks. For moderate to long-duration missions, carbon dioxide removal by molecular sieve adsorption is indicated. For long-duration missions, carbon dioxide removal by the electrodialysis process appears attractive because of the simplicity resulting from the continuous nature of this process. The problems associated with oxygen recovery from carbon dioxide arise from the integration of the carbon dioxide reduction subsystem with the rest of the atmospheric control system. Hydrogen required for the process is produced by water electrolysis. A control problem is associated with desorption of molecular sieve beds at a rate consistent with stoichiometric composition of the gases entering the catalyst bed. Heat recovery from the methanation process also presents a problem. Trace contaminant removal subsystem design is based on assumptions relative to the contaminant production rates within the space vehicle cabin. (Author's abstract, modified)**

06285

W. H. Calvert

DEVELOPMENT OF AN IMPROVED PROCESS FOR THE CATALYTIC OXIDATION OF ATMOSPHERIC CONTAMINANTS IN SUBMARINES. (Navy Marine Engineering Lab., Annapolis, Md.) Jan. 1966. 21 pp. (NEL MED Rept. No. 649/65.)

Studies in the development of an improved catalytic oxidation process reveal that polluted air causes other problems along with the corrosion which has been experienced in submarines. CO/H2 burner troubles are explained by data showing inhibition of Hopcalite due to adsorption of CO2 and organic halides and showing catalyst granules turning to dust because of thermal fracture. Minimization of air pollutants is necessary, and preprocessing to remove certain materials before the catalytic oxidation is a necessary part of air purification. (Author abstract)**

06305

A. M. Skvortsov, V. V. Rudryashov, V. G. Mukhin

FOAMS FOR DUST CONTROL AT SUB-ZERO TEMPERATURES. (In: Air Pollution in Mines - Theory, Hazards, and Control.) Akad. Nauk SSSR., p. 229-231, 1962. Translated from Russian
CFSTI: TT 66-51083

The possibility was examined of combining compatible surfactants manufactured by U.S.S.R. industry with antifreezes for water such as NaCl, CaCl2 and Al2(SO4)3, compatibility being understood as the quality of resulting in a solution which does not separate into layers and does not produce precipitates. There were also grounds to assume that in addition to lowering the freezing temperatures of our foaming agents these salts would improve the stability of the foams. A low-cost foam - forming preparation was developed which consists of an aqueous solution of 1.2% acolyat B (sodium salt of polyalkyl benzene sulfonic acid) and 5-20% NaCl, the latter playing the part of stabilizer. The foaming agent makes possible the preparation of stable foam with a high volume factor at sub-zero temperatures (down to 15.5C). According to tests made in a mine at sub-zero temperatures, the foam prepared with the foaming agent developed by the authors of the present paper can be used for the fixing of coal dust.##

06479

R. Setser and A. Faufman

DESULFURIZATION OF LIQUID HYDROCARBON FUEL FOR FUEL CELLS. (Interim technical progress rept. Jan. 10-July 10, 1966). Pratt and Whitney Aircraft, East Hartford, Conn. (July 30, 1966). 58 pp. (Rept. No. PWA-2885.)
CFSTI, DDC: AD 641183

This report covers the work performed during the period January 10, 1966 to July 10, 1966 on contract DA-44-009-AMC-1496(T). Removal of organic Sulfur Compounds from Liquid Hydrocarbon Fuels. It was the purpose of this contract to investigate the feasibility of using, and to select a method for utilizing, sulfur-bearing fuels of the JP-4, CITE or coil powerplants by desulfurization of the fuel. System studies were made and catalytic guard chamber materials evaluated experimentally to select a desulfurization technique and guard chamber catalyst-absorbent material. These investigations show that using the optimum desulfurization process with a 100-hour replaceable cartridge results in approximately a 3% weight increase in the indirect hydrocarbon-air fuel cell system if JP-4 with 400 ppm sulfur is used rather than a sulfur-free hydrocarbon fuel. Two catalysts (both of which are high nickel content, hydrogenation catalysts) were found to perform very effectively as catalyst-absorbent materials for desulfurization in the presence of steam reformer reactants. Finally, a demonstration test with JP-4 containing 470 ppm sulfur was run using an existing hydrogen generator modified for operation with a desulfurization cartridge and utilizing recycled dilute hydrogen. The 200-hour test without loss in performance demonstrated the potential of this method for utilizing JP-4 or CITE in indirect hydrocarbon-air fuel cell powerplants. (Author summary)##

065121

B. V. Marshall

CATALYTIC OXIDATION OF METHANE AT LOW SPACE VELOCITIES.
Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio, Research and Technology Division. (June 1966). 34 pp. (Technical Rept. AFFDL-TR-66-56.)

The feasibility of removing methane from an airstream by catalytic oxidation at low flows was investigated by passing a one percent, by volume, methane in airstream through an inhouse designed and fabricated stainless steel reactor. The reactor contained either Hopcalite, 5% T205, 5% R003 on alumina, or one of the following materials supported on alumina: 0.5% palladium, 0.5% platinum, 0.5% rhodium and 0.5% ruthenium. Some discontinuity in the data reported in the literature on methane oxidation at or around the transition flow region prompted a closer investigation in this area. In addition, space velocities around 500 flits per hour were used to insure chemical equilibrium and for comparison with the more common value of approximately 15,000 flits per hour used in most industrial applications. Experiments performed using the above catalysts revealed no deleterious effects associated with operating in the transition flow region, but did point out the advantage of using high space velocities for maximum catalyst utilization. The palladium catalyst proved superior to all others tested and catalyzed the reaction to completion at 560 F. Conversion versus temperature curves are plotted for each catalyst flow rate combination and the effect of space velocity on conversion at constant temperature is shown for the Hopcalite and palladium catalysts. Variables which affected the accuracy of experimentation most are discussed and possible improvements suggested. (Author abstract)##

06539

L. A. Chambers

GASOLINE COMPOSITION AS A FACTOR IN AIR POLLUTION. Preprint. (Presented at the American Chemical Society Meeting, Atlantic City, N.J., Sept. 16, 1959.)

The evidence accumulated by the Air Pollution Control District of Los Angeles for modifying gasoline composition as a means of reducing the formation of smog was illustrated. Studies were made with exhaust from engine operations using fuels of high, very low and intermediate olefin content. The evidence included correlations between the following: Relationships between fuel composition and eye irritation; gasoline composition to exhaust compositions; fuel olefins to plant damage; gasoline composition to aerosol formation; and gasoline compositions to ozone, aldehyde, and other intermediate formations. No fully adequate conclusion as to the explicit relationship between gasoline composition and smog can be formulated at present. It is evident that fuel constituents influence the smog forming properties of exhausts and that certain blends of gasoline are superior to others in this respect.##

06611

Bengtsoff, G. W.

FORMATION AND SUPPRESSION OF EMISSIONS FROM STEELMAKING PROCESSES. In: (Open Hearth Proc., Philadelphia, Pa.), 1961, Vol. 44, p. 120-147, 7 refs. (Presented at the 44th Conf.; Nat. Open Hearth Steel Comm. of the Iron & Steel Div., Phila., Pa., April 10-12, 1961.)

Much new information delineating the effect of process variables on iron-smoke formation has been developed from experiments on a 3-lb converter. This information has been combined with detailed analysis of the reactions between gases and molten iron to provide valuable clues for understanding the mechanism of smoke formation. Progress is being made toward achieving this understanding. From a practical standpoint, it appears that the possibility of adding methane to suppress smoke in basement converters has merit. The finding that an increased gas-inlet jet velocity decreases smoke in top blowing needs verification. If true, it will probably be of considerable practical importance. (Author's conclusions, modified) ##

06611

Constan, G. L.

MASS TRANSFER IN DROPS UNDER CONDITIONS THAT PROMOTE OSCILLATION AND INTERNAL CIRCULATION (A DOCTOR'S THESIS). (In partial fulfillment for the degree of Doctor of Philosophy, (Case Inst. of Tech., Cleveland, Ohio.) 141p, 1961

Single drops supported on hypodermic tubing have been studied in a wind tunnel to determine the effect of drop oscillation on mass transfer. The systems studied for the case where internal resistance controls consisted of absorption of SO2 gas by drops of glycerine, propylene glycol, and ethylene glycol. The results can be expressed in terms of effective diffusivity. No significant effect was noted in glycerine, whereas the glycols gave effective diffusivity values of 2-6. Frequencies, amplitudes, and internal circulation velocities in the drops were studied by cinematography, and are compared with predicted magnitudes. The effect of oscillation on external mass transfer coefficients was studied by sublimation of naphthalene spheres. In the cases where the vibrational velocity was less than the stream velocity, no effect was noted; this is in agreement with heat transfer studies. A technique has been developed for studying the effect of internal circulation on effective diffusivity, using forced circulation through a drop suspended on hypodermic tubing. A "pseudo-film thickness" is determined as a function of circulation velocity, and presents a means of predicting effective diffusivity. This technique has been demonstrated for the system SO2 and H2O, giving results in fair agreement with a correlation found in the literature.##

06616

Bureau of Mines, Washington, D.C.

AIR POLLUTION RESEARCH PROGRESS REPORT FOR THE QUARTER ENDED MARCH 31, 1968. In cooperation with the Public Health [illegible] (Pit., 11, 1967) 87 pp

This report covers progress on research in the following areas: Sulfur dioxide removal from flue gas; Removal of sulfur oxides from flue gas with manganese oxide and improved regeneration; Economic evaluation of processes for the removal of sulfur dioxide from flue gas; Characteristics and removal of pyritic sulfur from selected American coals; Pollution by chlorine in coal combustion; Flame characteristics causing air pollution; Characteristics and photochemical reactivity of vehicular emissions; Mechanisms of air pollution reactions; Effects of engine, fuel and combustion system parameters on vehicular emissions; Composition, smoke and odor of diesel exhausts.##

06679

N. V. Alekseyeva, and V. A. Khrustaleva

A STUDY OF AUTOMOTIVE EXHAUST GASES. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 279-88, 1962. (Gigiena i Sanit.,) 25 (5), 10-6, 1960. Russ. (Tr.)
CFSTI: 62-11103

Air samples taken in the immediate vicinity of automotive exhausts during heavy traffic conditions were analyzed for formaldehyde, acrolein, ketones, unsaturated and aromatic hydrocarbons, and CO. The data obtained are correlated with the type of vehicle and type of fuel used. Results showed that incomplete fuel combustion in motor vehicles was a potent source of air pollution. The effectiveness of a platinum catalytic oxidizing device for treatment of exhaust gases was tested and found to reduce pollution.##

06719

Nashnesss, A. C. and F. E. Murray

GAS PHASE OXIDATION OF METHYL MERCAPTAN. Intern. J. Air Water Pollution, Vol. 10, p. 245-251, 1966. 8 refs.

The reaction between methyl mercaptan and oxygen in the gas phase has been examined in the temperature range 301 to 375 C. Sulfur dioxide is the chief product of the reaction, being formed together with methane at the start of the reaction. Other products of the reaction are carbon monoxide, carbon dioxide, hydrogen, formaldehyde and methanol. In the presence of excess oxygen, complete conversion to sulfur dioxide is obtained quickly at 375 C. At lower temperatures and lower oxygen content much of the sulfur remains unaccounted for. In confirmation of previous work the rate of reaction was found to be strongly accelerated by oxygen and to be inhibited by mercaptan.##

06791

S. Nozaki

(SELECTION OF AIR FILTER.) Nozaki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo) 1[1 (2) 20-9, 1964. Jap.

Various considerations are given to the selection of air filters for ducts (not gases); the type of indoor pollution being controlled, type of filter desired, relation between combination of filters and efficiency, air resistance, rate of collection, maintenance, and economics. The kinds of dust collectors available and the sizes of particles collected are tabulated. For example, the large cyclone can be used for particles between 20 microns and 1 mm in size, the small cyclone for particles between 20 microns and 0.1 mm, the electrical precipitator for 0.01 to 0.01 mm size particles, and the supersonic collector for particles 0.05 to 2 microns in size. Tabulations were made of the collection of dusts and mists of such substances as cadmium, phosphorus, lead, o-dinitrotoluol, barium, pentachloronaphthalene, sulfuric acid, manganese, etc. Standard temperatures and humidities were maintained according to season, the values conforming to U.S. Air Force Technical Order 00-25-203 for clean rooms. A discussion of the efficiency and advisability of using two or three filters is given. In each case, total air resistance had to be considered. Calculation for rates of collection are also given.00

07224

E. Fiala and E. G. Beschmann

THE EXHAUST GAS PROBLEM OF MOTOR VEHICLES (PART 2). Das Abgasproblem der Strassenfahrzeuge (Teil 2). Automobiltech. Z. (Stuttgart) 67(12), 419-22 (Dec. 1965). Ger.

The CO content of cigarette smoke was determined by means of the Orsat apparatus and the Drager probe. The CO concentration varied between 2 to 5% which is about ten times the concentration in the engine exhaust gas of an automobile cruising at constant speed. The origin of unpleasant odors of two-stroke engines was traced back to strongly heated hydrocarbons forming aldehydes. The effects of various adjustments of the carburetor on the CO concentration were determined. Optimal positions of the choke plate and other adjustable parts of the carburetor were determined for some compact cars. Photographs illustrate the experimental set-up; and results are presented in graphs. Ignition limits of mixtures of air, nitrogen, and n-heptane were determined. The exhaust gas composition can be improved considerably with little effort if the loss of some peak power is tolerated.00

07162

Feint, H. J.

ELIMINATING ODORS BY CATALYTIC COMBUSTION. (Die Geruchsbeseitigung durch katalytische Verbrennung.) Text in German. Stadthygiene (Celle/Hasburg), 16(3):55-61, Mar. 1965. 11 refs.

With the rapid growth of the chemical industry, air pollution by odors has also increased. Catalytic oxidation and reduction offer possibilities for an economic solution of the problem. The principles of catalytic reactions are described. In a table the properties of four catalysts are compared with each other. These catalysts are: platinum on metal, platinum-palladium on ceramics, copper-chromium on aluminum oxide, and platinum on ceramics. The effectiveness of a catalyst depends on the gas mixture, the temperature, the type of catalyst, and the ratio: volume of gas/hour/volume of catalyst. The heat generated by the catalytic process is usually used to preheat the gas before it enters the catalyst. If the concentration of combustible substances is sufficient, steam may be produced in addition. An example is quoted where 67,000 cu. m. gas per hour with a latent heat of 900 kcal/cu. m. produce 31 tons of steam per hour. The equipment pays for itself in 2 1/4 years. For gases of low heat content, catalytic combustion under increased pressure is advantageous. Most economical is a gas turbine which compresses the gas and, after it has passed the catalytic chamber, uses the hot cleaned gas. The use of a gas turbine is recommended for gas volumes of more than 100,000 cu. m./hr, if measures for air pollution control become necessary.##

07560

STAINLESS STEEL ANTI-SMOG MUFFLERS--CUT AIR POLLUTION. J. Air Pollution Control Assoc., 9(2):101-06, Aug. 1959.

In August, 1958, installation of anti-smog mufflers was started on the Los Angeles City Schools' 81 big passenger buses. The muffler is almost entirely fabricated from chromium-nickle stainless steel, in order to resist oxidation and corrosion at the high operating temperatures. The muffler is designed to dispose of the unburned fuels presented in the exhaust system of a gasoline engine. It consists of a primary burning tube (pilot tube) through which the bulk of the exhaust gases pass during operations of low exhaust volume. Air is introduced through an adjustable opening into this tube and the resulting mixture is ignited by a long-reach spark plug. The current model was designed for heavy-duty gasoline-powered trucks and buses with 550 to 750 cu in. piston displacement. The mufflers have proved to be 97 percent effective in eliminating smog-producing hydrocarbons from engine exhausts (one of the principal causes of air pollution) on Los Angeles City School and Transit System buses. Users report less back pressure resulting in increased horsepower and gas mileage and improved engine performance. Some of the mufflers have successfully operated more than 100,000 miles without failure.##

07611

Ridgway, R. L. and J. C. Lail

AUTOMOTIVE AIR POLLUTION: A SYSTEMS APPROACH. J. Air Pollution Control Assoc., 10(3):136-140, Aug. 1960. 1 ref. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc.; Los Angeles, Calif., June 21-26, 1959.)

The application of systems engineering to the control of pollution from automotive exhaust is illustrated. First, the design and complex mechanical function of the flame afterburner system are analyzed. The efficiency of the device is discussed. Secondly,

an analysis is made of the natural meteorological modification of the concentration of air pollution to form an estimate of the results that might be brought about by the control of emissions. By examination of past records, September was found to be the worst month of the smog season. Concentrations of ozone and carbon monoxide for the month of September from 1955-1958 were studied. It was deduced, on the basis of analysis, that a pollutant which contributes to smog formation must be reduced in concentration by a factor of 2 or 3 in order to reduce the worst September experience to the level of the best. The efficiency of control devices required to reduce today's pollution is calculated.##

07620

Suter, H. R.

RANGE OF APPLICABILITY OF CATALYTIC FUME BURNERS. J. Air Pollution Control Assoc., 9(3):173-175, 180, Nov. 1959. (Presented at the 52th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., May 22-26, 1959.)

A more detailed exposition of the mechanism of vapor-phase catalytic oxidation is presented. Catalytic oxidation proceeds through 3 steps: adsorption on the active surface; chemical reaction; and, desorption. During adsorption turbulence will assist in the diffusion process and shapes of catalyst supports promoting laminar flow should be avoided. The clearance between active surfaces should be small. The general field of applicability for vapor-phase oxidation in the air pollution control field lies in streams containing combustible matter at concentrations below the lower limit of explosibility. The limitations may be physical, chemical, or practical and economic. Noncombustible inorganic solids are not affected by the catalyst, and should be absent from the stream lest they accumulate and cover the active surface. The material to be oxidized must yield innocuous products in order to serve the purposes of air pollution control. Specific catalyst poisons must be absent. Catalytic oxidation units are not bought "off-the-shelf" but are specially designed for various applications.

07616

Benforado, David M.

AIR POLLUTION CONTROL BY DIRECT FLAME INCINERATION IN THE PAINT INDUSTRY. J. Paint Technol., 39(508):265-266, May 1967. 1 ref. (Presented at the 44th Annual Meeting, Federation of Societies for Paint Technology, Washington, D. C., Nov. 4, 1966.)

Direct-flame incineration is discussed and up-to-date information available is summarized. Direct-flame incineration is an air pollution control process in which objectionable organic vapors or organic particulates are converted to harmless carbon dioxide and water vapor. The organic emissions are destroyed by exposure under the proper conditions to temperatures of 1000-1400 deg. F in the presence of a flame. Heat recovery equipment to cut down fuel costs is usually easily justified. A typical forced draft direct-flame incineration system with heat recovery showing how solvent vapors are eliminated from a can coating process is presented. Compared with other control processes for organic emissions, direct-

flame incineration is capable of achieving a high level of effectiveness. The basic variables affecting the design of a direct-flame incinerator are: (1) Incineration temperature; (2) The length of time the contaminated air is held at this temperature; and (3) The amount of turbulence or mixing designed into the combustor. Applications in which direct-flame incineration has been used successfully by paint manufacturers include controlling the exhaust from: resin and varnish cookers; and phthalic anhydride plants. Applications in which direct-flame incineration has been successfully used by industrial finishers include control of emissions from bake ovens such as automobile can coating, sheet metal, and wire enameling.

07806

Robinson, J. A. and W. R. Brehob

THE INFLUENCE OF IMPROVED MIXTURE QUALITY ON ENGINE EXHAUST EMISSIONS AND PERFORMANCE. J. Air Pollution Control Assoc., 17(7):446-453, July 1967. 8 refs.

A large, steam-heated, fuel vaporization tank was utilized as a carburetor in multicylinder engine testing at steady-state operating conditions. In comparison to normal carburetion, the tank provided improved air fuel mixture quality, i.e., completely vaporized fuel, thoroughly mixed with air, and at elevated temperatures. Although not a practical piece of engine hardware, the tank provided a means of determining the extent of gains to be made with improved mixture quality. Improved mixture quality produced slight reductions in rich mixture hydrocarbon and carbon monoxide concentrations but did not reduce the minimum emissions of these two exhaust contaminants. Minimum fuel consumption was similarly unaffected by improved mixture quality. The most important benefit of improved mixture quality was derived from improved geometric and cyclic fuel distribution; a substantial extension of the misfire lean limit. The significance of lean limit operation and its relationship to reduced exhaust contaminants is discussed in detail. (Authors' abstract)##

07807

Gruber, J., R. E. Harris, V. R. Rowe, and E. R. Cook

EFFECT OF RECYCLING COMBUSTION PRODUCTS ON PRODUCTION OF OXIDES OF NITROGEN, CARBON MONOXIDE AND HYDROCARBONS BY GAS BURNER FLAMES. Preprint, Bureau of Mines, Pittsburgh, Pa., 9?p., 1967. 20 refs. (Presented at the Symposium on Air Pollution Control Through Applied Combustion Science, 16th Annual Meeting, American Inst. of Chemical Engineers, New York City, Nov. 26-30, 1967)

Gas appliances designed to lessen the emission of oxides of nitrogen, carbon monoxide, and hydrocarbons, are desired. The formation and decay of oxides of nitrogen and carbon monoxide in the secondary combustion zone of gas-burner flames were investigated as functions of temperature, cooling rate (temperature gradient), and degree of recycling of combustion products into the primary combustion zone of the flame; preliminary measurements were made on hydrocarbons from flames. Recycling, though effective in reducing nitrogen oxides concentrations in effluent from gas

appliances, makes the flames longer and less stable. Nitrogen oxides may be reduced by keeping the primary combustion temperature as low as possible, preferably no higher than about 3,000 deg. F., and by starting to cool the combustion gases as soon as possible to about 2,300 deg. F at which temperature concentrations of nitrogen oxides do not increase within the residence time in most gas appliances. Concentrations of carbon monoxide are lowered by recycling of flue gases. The oxidation rate of carbon monoxide is strongly increased by increasing the oxygen concentration. Although the point has yet to be proven by future research, it appears that carbon monoxide concentrations may best be lowered by appliance designs that allow rapid induction of secondary air into the secondary combustion zones. Hydrocarbons can escape from gas burner flames by flowing from the preheat zone of partially lifted flames through the dead space into the surrounding cold atmosphere. Recycling of combustion gases, very low fuel-air ratio, and very high flow rates tend to promote partial lifting of flames from burner ports. It is possible that the emission of hydrocarbons by gas appliances may largely be avoided by designing for well-seated flames on burner ports.

07882

Reimer, R. F. and S. R. Friedman

THE PYROLYSIS OF REFUSE COMPONENTS. Combustion, 39(11): 31-36, May 1968. 5 refs. Presented at the Symposium on Air Pollution Control through Applied Combustion Science, 165th Annual Meeting, American Institute of Chemical Engineers, New York, N.Y., Nov. 26-30, 1967.

Exploratory laboratory tests of destructive distillation of organic wastes, and the prospects for complete gasification of the organic matter are reported. The objective is to determine the quantity and quality of the product gas that might be produced for use as a hot, raw boiler fuel, and possibly for chemical manufacture. Results show that by heating to 1500 F out of contact with air, the organic matter in municipal refuse can be converted to gas, organic liquids, water and char in roughly equal proportions by weight. The relative yields will be affected by the rate of heating. Higher yields of gas result from rapid heating. The fixed gases have a calorific value of 350-400 Btu per standard cu ft. The organic liquids range from alcohol to pitch. An extension of the investigation to include complete gasification and analyses by chromatography is suggested.

07889L

R. Lee, R. Woodruff, W. Johnson, W. Russ

ION EXCHANGERS IN REMOVAL OF AIR CONTAMINANTS. San Francisco Bay-Naval Shipyard, Vallejo, Calif., Chemical Lab.-0020-66, PB-1, ((30))p., March 1967. ((50)) refs.
DDC: AD 0660601

The ability of ion exchangers to be synthesized, modified, regenerated, or used in customary form to react with gaseous air contaminants and effect removal of these contaminants from air was studied. Results show that treated and untreated ion exchangers will react with a variety of gaseous materials and thereby cause removal of these materials from air. Reactions

which occur between ion exchange resins and ionized reactants in aqueous media will likely occur in gaseous systems. The possibilities of reactions between exchangers and organic contaminants at nominal temperatures cannot necessarily be foreseen. Favorable reactions between organic vapors and exchanged groups on ion exchange resins are being sought.##

07893

Stern, Arthur C.

AIR POLLUTION CONTROL - PROBLEMS FOR THE AUTOMOTIVE ENGINEER. Preprint, Public Health Service, Washington, D. C., National Center for Air Pollution Control, 15p., [(1967)]. (Presented at the National West Coast Meeting, Society of Automotive Engineers, Portland, Oreg., Aug. 16, 1967.)

The contribution of the automobile and other gasoline power vehicles to pollution are discussed. The adverse effects and the contributing pollutants are cited. Control efforts are being undertaken under the mandate of the Motor Vehicle Air Pollution Control Act, which authorizes the establishment of standards for the emission of substances harmful to public health. Compliance certification of new motor vehicles and engines and the technical problems involved are discussed. Approaches to vehicular-emission control are discussed, specially the inter-relationship of engine, fuel, and refinery design. The corresponding problems of the automotive engineer are cited.

07971

Rubin, Ira

CHEMICAL SUPPLEMENTS IN AIR POLLUTION CONTROL PROGRAMS. Apollo Chemical Corp., Clifton, N.J., PI-67-65, ([12])p., 1967. 12 refs. (Presented at the National Fuels and Lubricants Meeting, New York, N. Y., Sept. 13-18, 1967.)

Several classes of chemical additives for petroleum fuels and coals have been developed that reduce air pollutants from smoke stacks. These are: (1) combustion catalysts, (2) smoke-suppressants, (3) oil-ash (slag) modifiers, (4) absorptive agents, (5) SO3 neutralizing agents. The application of these products to specific air pollution reduction programs is shown by several case histories involving the following power plants: (1) 4-cycle diesel trucks, (2) 2-cycle diesel buses, (3) diesel power generating equipment, (4) gas turbine for peaking operations, (5) school heating equipment with No. 4 oil, (6) industrial plant boiler with Bunker C fuel, (7) refinery boiler burning No. 6 oil and gas, (8) marine steam plant, (9) utility power plant, (10) coal-fired utility. These specific examples cover the known types of polluting materials from fuel and coal burning power plants. A ready guide for specific utilization of the chemical treatments is summarized. It has been shown that chemical supplements are 80 to 100% effective for improving the combustion of the fuels resulting in a decrease of smoke, particulate matter, odors and ammonia as well as acidic and acid SO3 with a resultant reduction in stack plume. Chemical supplements appear to be uneconomical generally to completely eliminate SO2 from the exhaust gases. There are indications, however, that by reducing

the aerosols forming soots and particulate matter from the exit gases, the smog-forming tendencies of SO2 are reduced substantially.##

00075

Griswold, S. S.

REGULATION OF NEW MOTOR VEHICLES. Preprint, Public Health Service, Washington, D. C., Division of Air Pollution, 7p., 1966. (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

The problem of air pollution from motor vehicles is discussed. The basis for the discussion is the Motor Vehicle Air Pollution Control Act. It is an amendment to the Clean Air Act of 1963 and was signed by President Johnson on October 20, 1965. It is designed to achieve uniform national control by limiting the emission from all new motor vehicles introduced into commerce, whether manufactured in the United States or imported from abroad. It authorizes the Secretary of Health, Education, and Welfare to establish standards for the emission of any substance which in his judgment is, or may be, injurious to public health or welfare and to require compliance with these standards. At the same time the Act specifies that appropriate consideration be given to technological feasibility and economic costs in prescribing standards applicable to new motor vehicles or engines. Federal emission standards were formally promulgated on March 30, 1966. These standards are applicable to the 1968 model year and reflect those currently in effect in the State of California. To implement these standards, to test for compliance and, generally, to provide the necessary machinery for insuring that the public gets the control it needs, the Abatement Branch of the Division of Air Pollution is establishing a fully equipped laboratory at the Willow Run Airport near Detroit. This laboratory also has the responsibility for evaluating the adequacy of existing standards and the need for more severe standards and less complex test procedures. Field surveys of equipped vehicles in California and elsewhere are also being being conducted. Initial certification of new systems is approved on the basis of performance of test vehicles, but the continued approval for succeeding years will be determined by the systems' effectiveness when evaluated under realistic driving conditions.##

00080

Rubin, I.

UTILIZATION OF ADDITIVES IN CONTROLLED COMBUSTION PRODUCTS. Preprint, Apollo Chemical Corp., Clifton, N. J., 11 p., 1966. (Presented at the ASCAR Technical Symposium on Combustion and Air Pollution Control, Oct. 25, 1966.)

Practical applications of chemical additives for reducing air pollution with petroleum fuels are discussed. Successful results have been achieved in the field by the use of additives for fuel oils, both distillate and residual fuels. The major pollutants are: (1) black particulate matter representing primarily unburned hydrocarbons; (2) sulfur oxides (SO2 and SO3). With distillate fuels, where the sulfur content generally is below 0.5%, our primary concern is particulate matter and to a somewhat

lesser degree, carbon monoxide, aldehydes and nitrogen oxides. With residual fuels, sulfur, as SO2 and SO3, is the dominant consideration, although the ability to reduce black smoke emission by means of chemical additive is certainly a valuable contribution to air pollution control. The three effective classes of chemical additives are: (1) combustion catalysts, (2) oil-ash slag modifiers, and (3) chemical neutralizing agents. In some cases, these chemical agents can be combined to give one or more benefits. In a recent trial at a power plant, one of our products, SSI-3(M), reduced the black smoke at the same time that it lowered the SO3 content of the flue gas from 90 to 5 parts per million. The case histories cited show how chemical additives are being used to reduce air pollution at the same time that they make their contribution to better overall fuel utilization. AA###

08082

J. Meaney, R. L. Novack

INVESTIGATION OF CATALYTIC COMBUSTION OF IMPURITIES OF AIR. Bolt, Beranek, and Newman, Inc., Cambridge, Mass.; Prototech Co.; Contract NAS-5-3085, NASA-111, NASA-CR-66168, 58p, June 30, 1967.
CFSTI: N67-29987

A study was made of the catalyzed combustion of impurities in air. These studies included laboratory tests of several configurations of corrugated catalyst support to minimize air flow resistance and optimize catalyst length. The two catalysts used were: platinum and palladium, and the three impurities were hydrogen, carbon monoxide, and methane. A catalytic coil consisting of parallel corrugated ribbons of chromel alternated with layers of asbestos coated with precious metal catalyst, constructed to provide straight-through channels for air passage, was used to oxidize carbon monoxide, hydrogen and methane, present as dilute (0.5%) impurities in air. Platinum when applied to the asbestos was significantly inferior to palladium for the oxidation of methane. In addition, the catalyst operating temperature was found to decrease with increasing surface concentration of palladium, with length of catalyst, and with decreasing channel size. From this, a plan for an integrated air purification system including heat exchanger and insulation was developed, based on a laboratory tested catalyst. The system should remove virtually all of the carbon monoxide and hydrogen from the air while leaving a residual of no more than 250 ppm of methane.##

08085

A. Michaels

STATUS REPORT, (SOLID WASTE DISPOSAL) Preprint, Philadelphia, Pa.; (7) p.; (1966). (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 13, 1966, Paper No. D-1.)

The air pollution contribution made by urban society in disposing of solid wastes, is discussed. It has been reported that an average of 4.5 lbs. of refuse per person each day, is generated,

as normally collected for disposal. Although no refuse disposal method apportionment was available, an attempt was made to estimate the percentage disposed of by the various methods used in order to evaluate the relationship of refuse disposal to air pollution. It is estimated that 10-15% of all refuse is disposed of by incineration. It is further estimated that 20 to 25% of urban refuse is disposed of by open burning. Approximately 60% of all refuse is disposed of by landfilling, and 10% by various other methods including hog feeding, grinding, salvage and reclamation, etc. The quantity of particulates emitted by incineration varies from 10-50 lbs. per ton of material burned. Open burning accounts for quantities varying from 50-100 lbs. per ton. Particulate emissions are calculated for the disposal methods. In addition to particulate matter, poor refuse disposal by combustion results in the emission of gaseous pollutants, particularly carbon monoxide and hydrocarbons. If all of the refuse currently disposed of by burning were to be properly incinerated, the total particulate emissions would be 800,000 tons per year, harmful gaseous emissions would be negligible and the total pollution contribution would be well under 1% of the total annual pollution quantity. Even if all refuse were to be incinerated properly, the total pollution emission quantity would be under 1 1/2%. It would appear that the disposal of refuse by incineration need not cause meaningful air pollution.**

08162

Ratnak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CFSTI: TT 60-21675

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of sour acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

00207

Nourtzian, S. and Mauro A. Accomazzo

THE APPLICATION OF THE COPPER OXIDE-ALUMINA CATALYST FOR AIR POLLUTION CONTROL. Can. J. Chem. Eng. (Ottawa), 39(2):81-91, April 1961. 8 refs.

The catalytic combustion of 1-hexene present in diluent nitrogen in the concentrations of 1170 ppm and 3000 ppm by excess oxygen, has been studied in the presence of CuO-Al2O3 (1:1) catalyst in the temperature range 292 deg. to 428 deg. C. and gas space velocity in the range 9000-16,000 hr.-1. The experimental data on the kinetics of the reaction were found to fit an empirical half-order law with respect to the 1-hexene concentration. The presence of water vapor in the reactants was found to have no effect on the efficiency of the catalyst at temperatures higher than 400 deg. C. The above results were similar to those obtained for the catalytic oxidation of n-hexane studied earlier. The possible use of the above copper oxide-alumina catalyst for the simultaneous removal of hydrocarbons and carbon monoxide present in the auto exhaust gases has been tested, making use of a 1955 six-cylinder automobile engine run on leaded gasoline fuel. The hydrocarbon and carbon monoxide concentrations encountered in these studies varied in the range 170-16,000 ppm and 1-7 percent respectively. It was found that the minimum initial temperature of the catalyst bed required for the complete removal of both hydrocarbons and carbon monoxide, simultaneously, was 326 deg. C. under no load condition, 342 deg. C. under an engine load of 2.5 hp, 400 deg. C. under an engine load of 5.1 hp or higher, and 316 deg. C. under deceleration conditions. The catalyst showed no deterioration in performance even after 100 hours of continuous service in conjunction with the above auto exhaust gases. Authors abstract

00145

Cooper, Jonathan C. and Frank T. Cunniff

CONTROL OF SOLVENT EMISSIONS. Proc. ASCAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 30-41, Oct. 23, 1967.

Four different approaches can be taken toward controlling solvent vapor emissions from industrial and commercial operations. One way is to avoid air pollution entirely by using water as the solvent. A second approach is to reduce the severity of the pollution by changing to organic solvents with low photochemical reactivity. A third control method is to destroy the escaping solvent vapors by incineration. When properly designed and installed this method is very effective and the capital costs involved are moderate. The fourth type of control method is to capture the emitted solvent vapors so that the solvent can be recovered for reuse. Three techniques are available - adsorption of the vapors in a scrubbing liquid, condensation by cooling, and adsorption on activated carbon. Of these, activated carbon adsorption is the most generally applicable and is capable of achieving the highest degree of solvent recovery, with resulting attractive payout.##

00152

Rowson, H. R.

DESIGN CONSIDERATIONS IN SOLVENT RECOVERY. Proc. MECAR Symp.; New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 110-128, Oct. 23, 1967.

The growing understanding of the adsorption process has led to the ability to modify the properties, such as pore size distribution and overall activity of the adsorbent, to suit the particular separation that is required. This has been accompanied by such development in the last few years of the fixed bed and fluid bed mechanical contacting that is available to carry out these separations, and as a result of these parallel developments, it is now possible to carry out with very great efficiency a large number of complicated separations. The fixed bed plant consists of a number of vessels containing activated carbon into which the solvent laden gas stream is introduced in turn. The solvent laden stream is allowed to flow through the carbon bed, the solvent is adsorbed onto the activated carbon, and the solvent free air is discharged into the atmosphere. In the fluidised bed process, the solvent laden air or gas stream is passed upwards through the adsorber vessel which contains a number of shallow fluidised beds of activated carbon. The solvent is progressively adsorbed onto the carbon, and the solvent free air is discharged through dust collectors to the atmosphere. This process has a number of advantages compared with the fixed bed process: 1. Exceptional contacting between solvent and adsorbent giving very high efficiencies; 2. Complete continuous automatic operation, with minimum labor requirements; 3. Competitive in cost for the medium and larger installations; 4. Low stripping steam usage (about half that of equivalent fixed bed plants). 5. Low ground area requirement; 6. High concentration of solvent in recovered aqueous liquor simplifying onward processing; 7. Inherently safe even with highly inflammable solvents. Factors affecting the choice of solvent recovery systems include 1. Air flow, 2. Concentration of solvent, 3. Solvent type and 4. Operating continuity. For the majority of applications in a well maintained fixed bed plant, efficiencies of 97% to 98%, defined as the ratio of solvent outlet to inlet concentration over the adsorber, are quite easily achieved. In a well run fluid bed plant, efficiencies of 99% measured over the adsorber are quite readily attainable. Other new applications for adsorption techniques include the removal of small quantities of noxious material from large volumes of air, the separation of hydrocarbon gases, and the control of SO2 emission from power station flue gases.##

00165

Howard G. Rashe, Lennart H. Johansson, Joseph L. McCarthy

SEKOR III: PRELIMINARY ENGINEERING DESIGN AND COST ESTIMATES FOR STEAM STRIPPING KRAFT PULP MILL EFFLUENTS. TAPPI, 50(6):270-275, June 1967. 9 refs.

An illustrative, preliminary engineering design and cost estimate has been carried out relative to the SEKOR-B

(trayed column) process. As a basis for such calculations, experimental determinations have been made of vapor-liquid equilibrium constants for the sulfur-containing components, CH_3SH, $(CH_3)_2S$, and $(CH_3)_2S_2$ in dilute concentration in water at 1 ata total pressure, and, also, for the substances limonene, alphapinene, and alpha-terpineol, which are major constituents of the recovered volatile oil. It is shown that all substances are of higher volatility than water and may be steam-stripped, and that alpha-terpineol and dimethyl disulfide are the most difficult to strip from water. The optimum feed/steam ratio, reflux rate, and number of stages required to strip H_2S and the above components from condensates of a 900 ton/day kraft pulp mill were calculated. To reduce the concentration of $(CH_3)_2S_2$ to 1% of its feed concentration, capital cost was estimated to be $51,500 to treat 1,000,000 lb/day of blow and relief gas condensates. If amortized over a 5-year period, this capital cost together with operating costs is estimated to result in a total cost per ton of dry pulp of $0.25/ton for 5 years and of $0.13/ton thereafter. If the sale of recovered crude TERPOR oils at $0.04/lb is feasible, and if hot process water is valued at $0.01/1000 gal, the above costs for treating blow and relief gas condensates are estimated to approximately $0.07/ton pulp. The cost and design bases used are described in some detail to allow potential users to undertake similar calculations compatible with local conditions, and, thus, to obtain alternate costs per ton of pulp if so desired. AARES

00876

Sherwood, Peter W.

NEW DEVELOPMENTS IN HYDROCARBON GAS TECHNOLOGY. (Neues aus der Kohlenwasserstoffgas-Technologie - Folge 13.) Text in German. Gas Wasserfach (Munich), 108(15):602-603, April 1967.

Efforts have been made to combat SO_2 pollution by obtaining sulfur from stack gases as a by-product. An apparatus from the Institute of Technology in Tokyo and one developed by Monsanto work on the same principle. Stack gases containing 0.2% sulfur dioxide are separated from the fly ash and passed through V_2O_5, thereby converting the sulfur dioxide to sulfite. Monsanto then condenses the sulfite to 70% sulfuric acid, while the Japanese add ammonia to the sulfite to form ammonium sulfate, which can be used as fertilizer. In both methods the purified waste gas contains only 0.02% sulfur dioxide. Wide use of gas fuel cells by 1970 is predicted by the Institute of Technology in Chicago. The cells may be used in mass production items such as automobiles within 10 years; in some trial cells efficiencies of 70-80% have been obtained already. The most commonly used fuel is hydrogen, although the economical production and safe handling of this fuel still presents problems. Cells using hydrazine and methanol are under development. For power plants of 10 to 1,000 kW., paraffin fractions, which are split by a nickel catalyst at 500-1,000 deg C., seem to be the most economical fuel for the near future.##

00000

Lohner, Kurt, Herbert Muller, and Walter Sander

ABOUT THE PROCESS-TECHNIQUE OF THE COMBUSTION OF EXHAUST GASES IN GASOLINE ENGINES IN STATIONARY OPERATIONS. ((Uber die Verfahrenstechnik der Nachverbrennung der Abgase von Ottomotoren bei stationarem Betrieb.)) Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 109(33):1988, Nov. 1967.

To reduce the amount of carbon monoxide and hydrocarbon emission during the stationary operation of engines without deleterious effect on the engine, certain modifications were undertaken. It was found that complete combustion can be obtained by the addition of air at a fast or medium engine speed. However at idling speed enough exhaust gases are formed to make additional combustion necessary. By adding air directly into the cylinder during the exhaust cycle, a nearly complete combustion can be obtained. Since this procedure is expensive, the simpler procedure of adding the air behind the exhaust valve and providing combustion by means of catalysts was undertaken. A small catalyst vessel was constructed for idling speeds with a bypass to reduce any excessive exhaust gas pressure which might build up at full speed operation. The catalyst was placed directly behind the motor to facilitate quick warm-up of the engine. The catalyst can also be placed near the exhaust vents providing an afterburner for each cylinder. To obtain a process with few moving parts, wires with an array of catalyst beads were placed vertical to the exhaust gas stream. The effectiveness of this procedure is comparable to the bypass procedure, but the catalyst must endure temperatures above 1,000 deg C at full speed, shortening its effective life, since there is no provision by a bypass.##

00096

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL MOTORS. I. GASOLINE ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. I. Ottomotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(8):564-568, Aug. 1967.

The California Test and the events which produced the California and U.S. Government laws for the reduction of air pollution from gasoline engines are described. The differences between the California and U.S.A. specifications are outlined. The conditions in regard to air pollution from gasoline engines in various European cities are discussed and compared with those found in Los Angeles. The Europe test, concerned mainly with CO emission, is described, evaluated, and compared with the U.S.A. tests which set limits for both CO and hydrocarbons. The three most important control methods for exhaust gases are: 1) Catalytic oxidation, which is unsatisfactory, because the catalyst weakens after 8,000 km. (it became nearly ineffective at the end of a 21,000 km. test run). 2) The Chrysler Clean Air Package system, which depends on a particular combination of gasoline mixture and ignition time, so that with small alterations in the combustion

chamber the conditions of the U. S. law are fulfilled. 3) The exhaust air injection system, which depends on air being blown into the exhaust system. This system, which is used by Ford and General Motors, also fulfills the U.S. requirements.##

00536

Miller, R. R. and R. J. Wilhoyte

A STUDY OF CATALYST SUPPORT SYSTEMS FOR FUME-ABATEMENT OF HYDROCARBON SOLVENTS. J. Air Pollution Control Assoc., 17(12): 791-795, Dec. 1967. 8 refs.

In a stainless steel pilot plant system, operating with combined thermal incineration and catalytic oxidation, studies have been made of the influence of catalyst-support geometry on abatement efficiency. Catalyst supports tested were ceramic spherical pellets, metal foils, and ceramic honeycomb structures, all with precious metal catalyst. Data obtained cover a range of space velocities from 30,000 to 175,000 scf/hr-cu ft bed and a range of catalytic reactor temperatures from 150 to 950 deg C. Results show that optimum fume-abatement performance is obtained by combining incineration and catalytic oxidation and that catalyst support geometry has a significant effect on performance. (Authors' abstract)

00567

Berndinger, Hans-Otto

MOTOR VEHICLE ENGINES. (Kraftfahrzeugmotoren) Text in German VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 108(19):842-845, July 1966. 10 refs.

Two new designs in motor vehicle engines are described. In one engine the compression ratio was raised to 11.6:1 by direct injection of air into the engine, creating a strong rotation of air around the cylinder shaft. A savings of 10-20 percent of fuel was obtained. In the second design the compression ratio was raised to 10:1 to 12:1 by external ignition using a specially developed spark plug. Greater fuel savings and a low carbon monoxide and uncombusted hydrocarbon content in the exhaust were obtained. A detailed description of the California test for automobile exhaust gas emissions as well as figures for the amount of permissible carbon monoxide and hydrocarbon emissions in California and in the United States at large, beginning in 1968, are given. Five methods to reduce the emission to the California standards are described: (1) fuel injection; (2) reuse of combustible gases which escape around the piston into the crankcase; (3) the Chrysler Cleaner Air Package (CAP); (4) recombustion (a good portion of the combustible gases can be burned in the exhaust manifold by the addition of air directly behind the exhaust valve); (5) catalytic recombustion at low temperatures. At the present time the catalyst is easily poisoned, particularly by lead deposits. Further technological developments along this line are possible.

08599

Gamer, Carl H. and Rastinus Hus

ECONOMICS OF HYDROGEN PRODUCTION AND HYDROTREATING. (Wirtschaftliche Herstellung von Wasserstoff und Hydrotreating.) Text in German. Erdoel Kohle (Hamburg), 20(7):582-588, July 1967. 17 refs. (Presented at the Annual Meeting, German Assoc. for Mineral Oil Science and Coal Chemistry and the Austrian Society for Petroleum Sciences,Munich,Oct. 13B 1966)

The increased upgrading of oil refinery processes--requiring additional sources of hydrogen--is advocated for Germany. Despite added costs, such steps should result in financial gains of over 60 percent; moreover, the probable future limitations of sulfur content in fuels by means of governmental air pollution control regulation also suggests increased use of such hydrogen refining processes. Other technical advantages of the use of hydrogen production facilities are cited. The conditions and costs of hydrogen production for three different processes (steam methan pyrolysis, steam naphtha pyrolysis, partial oxidation) are tabulated. In the future it may be desirable, as an air pollution abatement measure, to combine thermal power plants with refineries so as to convert the heating oil to heating gas through partial oxidation; should this actually become an accepted practice, considerable added savings in hydrogen production--hence in upgraded refinery processes--will be realized.

08609

Fiala, Ernst, and Zenchmann, Ernst-Georg

IRRITATIVENESS OF EXHAUST GAS ODOR. (Reizigkeit von Abgasgeruch.) Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 109(26):1139-1141, Aug. 1967. 5 refs.

The fresh air dilution of automotive exhaust gases at which the odor was just detected by 10 subjects was used to measure the odor intensity. The engine was operated at various conditions and with air added directly toward exhaust valve. The subjects first breated fresh air, to which untreated exhaust was added until the odor was detected. The amounts of carbon monoxide and hydrocarbons were measured at this point, for each of the different operating conditions. The same procedure was repeated with the addition of air toward the exhaust valve. Graphically presented data show that while the emission of CO and hydrocarbons considerably diminished with the addition of air, the odor intensity of the gas increased significantly.

08631

ZENITH DUPLEX INDUCTION SYSTEM. Automobile Engr., 57(3):98-99, March 1967.

The basic features of the Zenith Duplex Induction System are presented. The emission of hydrocarbons and carbon monoxide from the exhaust is effected primarily by increasing efficiency of combustion in the cylinders. The basic aim is to supply a dry, but not overheated, mixture to the cylinders. A relatively small-bore mixture-feed pipe is used in parallel with the main

manifold, whereby the mixture is taken through an exhaust-heated chamber and dried. Two throttle valves are employed, one controlling flow in the main system and the other controlling flow through the small-bore pipe. An interconnecting linkage is arranged so that one throttle opens, before picking up and opening the other. When the main throttle valve is closed the small-bore system is open. During the initial stages of acceleration from rest or low speeds, the mixture is diverted through the exhaust-heated chamber and returned to the main tract down-stream of the secondary valve. The heat-exchanger box has thin sections between the exhaust gas and the fuel-air mixture so that the time lag, between the starting of the engine from cold and its warming up sufficiently for control of the mixture, is minimized. With this system low air:fuel ratios can be adopted. Sudden acceleration does not wet the walls of the manifold as the pressure within it rises, and therefore a potential source of variation in mixture strength is eliminated. The mixture does not have to be enriched for winter conditions. All these features lead to significant fuel economy as well as reduction of hydro carbon and carbon monoxide emissions.##

09837

Rane, J. M.

STATUS FORECAST FOR AIR POLLUTION CONTROL - 1972. Air Eng., 9(3):33-34, 37, March 1967.

A forecast of what will happen in the field of air pollution control in the next five years is presented. The pollutants covered are smoke, visible dusts, visible plumes, hydrocarbons, diesel engine fumes and smokes, and oxides of sulfur.##

09837

California Motor Vehicle Pollution Control Board. Preprint, ((16))p., May 20, 1967.

EFFECTIVENESS OF EXHAUST CONTROLS IN PUBLIC USE.

Analysis of emissions from automobiles with exhaust control devices indicates a 70% reduction in hydrocarbons and a 50% reduction in CO compared to the existing car population in California. However, the data indicate an emission deterioration trend with mileage. Some indications of these trends are: (1) All emission trends go over the hot-start standards of 250 ppm hydrocarbons and 1.2% carbon monoxide before 12,000 miles is reached; and (2) All emissions except one manufacturer's carbon monoxide show significant deterioration beyond the mileage normally associated with deposit buildup in the combustion chambers. Spark timing and idle speed inspection data on 50 new cars and 100 privately-owned cars show large percentages of the cars are outside the tolerances when new and the percentages increase significantly with time and mileage indicating that they are being further maladjusted in the field. It is concluded that car companies must multiply their efforts in the following areas: (1) Improvement of basic performance ability of exhaust systems; (2) Adjustment to factory specifications at the factory; (3) Actual performance of proper adjustments by dealer service personnel as part of their training programs; and (4) Development of fixed or limited range adjustments.##

09195

Katherine C. Reilmig

LIQUID FUELS FROM COAL WITH H-COAL. Preprint, Hydrocarbon Research, Inc., New York, 6p., 1966. (Presented at National Coal Association Technical-Sales Conference and Bituminous Coal Research, Inc., Annual Meeting, Sept. 14-15, 1966, Pittsburgh, Pa.)

The H-Coal process is based upon a new reactor concept known as the ebullated bed reactor. Dried and pulverized coal is combined with recycled oil to form a slurry. This slurry is fed continuously with hydrogen into a reactor containing a bed of ebullated catalyst. The coal is catalytically hydrogenated and converted to liquid and gaseous products. Products are separated and result in fractions of gas, light distillate, mid-distillate, and vacuum bottoms slurry. In this reactor system 90% of the coal on the moisture- and ash-free basis is converted to liquid and gaseous products. Liquid products from the coal hydrogenation step are hydrocracked, hydrotreated, and reformed to produce gasoline, No. 2 furnace oil, and a very small amount of No. 6 fuel oil. All of the No. 2 furnace oil can be converted to gasoline if desired. Benzene and liquid petroleum gas (LPG) may be recovered and sold. An economic summary for an H-Coal refinery with a nominal capacity of 1000,000 barrels per standard day (bpsd) is presented. Three cases are presented. The first case produces gasoline and furnace oil in a ratio of 2 to 1. The second case produces all gasoline, and the third case is the same as the second case with the exception that 12,000 bpd of LPG and 3000 bpd of benzene are recovered. Based on the progress made in development of the H-Coal process it is expected to be ready for commercialization in the early 1970's and will provide the coal industry with a means to compete for the gasoline market and to utilize the large reserves of high-sulfur fuel.##

09325

D. W. Goldthan

DIESEL ENGINE EXHAUST SMOKE: THE INFLUENCE OF FUEL PROPERTIES AND THE EFFECTS OF USING BARIUM-CONTAINING FUEL ADDITIVE. Preprint, Society of Automotive Engineers, 23 p., 1967. 11 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967. Paper 670092.)

Even though the combustion gases of diesel fuel are much less toxic than those of gasoline, exhaust smoke has increased proportionately with the number of diesels in use and has become a major problem. This paper describes the influence of base fuel composition on smoke, and the results of using a barium-containing additive in the fuel. The toxicological aspects of using the additive are considered, together with certain other side effects that might arise. Details are also given of the various means for measuring smoke, and of existing legislation to control the nuisance. (Author's abstract)##

09129

Sullivan, R. F., W. Cornelius, and D. L. Stivender

A COMBUSTION SYSTEM FOR A VEHICULAR REGENERATIVE GAS TURBINE FEATURING LOW AIR POLLUTANT EMISSIONS. Preprint, Society of Automotive Engineers, 20p., 1968. 10 refs. (Presented at the Combined Fuels and Lubricants, Powerplant and Transportation Meetings, Pittsburgh, Pa., Oct. 30-Nov. 3, 1968, Paper 680916.)

The combustion system developed for the GT-309 regenerative gas turbine is used to illustrate pertinent structural, performance, and exhaust emission considerations when designing for a vehicular gas turbine application. The development of each major component and the performance of the combustion system as a whole are reviewed. The satisfactory performance and durability potential of the GT-309 engine combustion system have been demonstrated by extensive operation in a component test facility and in several test cell and vehicle installed engines. Exhaust emissions of unburned hydrocarbons and carbon monoxide are minimal and are of no concern from an air pollution standpoint. No objectionable exhaust smoking and odor are produced. As in the case with current spark ignited and compression ignition engines, the emissions of oxides of nitrogen in the present state of development do not satisfy the proposed 1980 California limit for this air pollutant on an equivalent weight flow basis. (Authors' Abstract)

09137

Lawrence G., J. Buttivant, and C. G. O'Neill

MIXTURE PRE-TREATMENT FOR CLEAN EXHAUST --- THE ZENITH "DUPLEX" CARBURATION SYSTEM. Preprint, Society of Automotive Engineers, 16p., 1967. 4 refs. (Presented at the Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15-19, 1967, Paper 670484.)

A carburetor adapted to exploit the control of exhaust emissions through consistency of metering and mixture quality, particularly in conjunction with a dual bore inlet manifold, is discussed against the background problems faced by the European motor industry. The development and incidental research data which determined the design are followed by a description of production and quality assurance techniques, with special reference to the evolution of automatic flow testing apparatus. (Authors' abstract)##

09791

Lebuc, Marc F.

ADSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 192-201, 1967.
GPO: 806-614-10

The mechanisms of the adsorption process and adsorption equipment are described with particular emphasis on activated carbon as the adsorbent. Saturation, retentivity, adsorption of mixed vapor, heat of adsorption and carbon regeneration are included in the discussions. Activated carbon is most suitable for removing organic vapors. It adsorbs substantially all the organic vapor from the air at ambient temperature regardless of variations in concentration and humidity conditions. The limitation for molecules capable of removal by physical properties is that they must be higher in molecular weight than the normal constituents in air. In general, removal is practical for gases with molecular weight over 45. Probably the only solvent used with molecular weight below 45 is methanol. The design and operation of the fixed-bed adsorber, conical fixed-bed adsorber, and continuous adsorber are described and illustrated. An activated carbon adsorption bed should be protected from particulate matter that can coat the surface of the carbon. This can be accomplished by the use of efficient filters. Corrosion of the bed must also be prevented. Corrosion can be controlled by the use of stainless steel or by application of a protective coating of a baked phenolic resin. Polar and non-polar solvents are equally adsorbed by activated carbon, but the recovery of polar compounds on stripping with steam requires an additional step of fractionation to effect a separation from the aqueous solution. Other solids possessing adsorptive properties are alumina, bauxite, bone char, decolorizing carbons, Fuller's earth, magnesia, silica gel, and strontium sulfate. Their industrial uses are listed.

09795

Chatfield, Harry E. and Ray R. Ingels

GAS ABSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 210-232, 1967.
GPO: 806-614-40

Gas absorption equipment is designed to provide thorough contact between the gas and liquid solvent in order to permit interphase diffusion of the materials. This contact between gas and liquid can be accomplished by dispersing gas in liquid or vice versa. Absorbers that disperse liquid include packed towers, spray towers and venturi absorbers. Equipment that uses gas dispersion includes plate or tray towers and vessels with sparging equipment. The principles of designing plate towers and packed towers are discussed in detail. The following items are included in the discussion on packed towers: packing materials, liquid dispersion, tower capacity, tower diameter, number of transfer units, height of a transfer unit, and pressure drop through packing. An example of calculations involved in designing a packed tower for the removal of NH_3 is illustrated. Liquid flow, plate design and efficiency, flooding, liquid gradient on plate, plate spacing, tower diameter, and the number of theoretical plates are included in the discussion of plate towers with specific emphasis on bubble cap plates. An example of the calculations involved in determining the number of plates required and estimated diameter of a plate tower is illustrated. The choice of gas absorption equipment is usually between a packed tower and a plate tower. Both devices have advantages and disadvantages. Factors which the final selection

should be based upon are listed. Spray-type absorbers and venturi absorbers are also briefly discussed. These towers are primarily used for removing particulates from gas streams, though they have some gas absorption applications. The gaseous air contaminants most commonly controlled by absorption include SO2, NH3, NOx, and light hydrocarbons.

10047

Conn, A. L. and J. B. Corns

EVALUATION OF 'PROJECT H-COAL'. American Oil Co., Whiting, Ind., Research and Development Dept., Contract 14-01-0001-1188 Proj. 642 79p., Dec. 5, 1967.
CFSTI, ODC: PB 177068

A feasibility study of the 'H-coal' process is presented which covers experimental works, conceptual design, and economics. The H Coal process is the manufacture of hydrocarbon liquids by hydrogenation of coal. Parts of the process discussed include: Coa preparation, coal hydrogenation, heavy gas oil hydrogenation, fluid coking, middle distillate hydrotreating, middle distillate hydrocracking, naphtha treating and reforming, naphtha recovery, hydrogen manufacture, hydrogen compression and sulfuric acid and ammonium sulfate plant. Based upon a thorough study of the process and the economics involved, the H-coal process is seen to be competitive with other means of petroleum manufacture.

10458

Wood, P. C., O.C.Fuhank, and J. Sosnowski

HYDROCRACKING SPREADS INTO NEW AREAS. Oil Gas J.,66(25):83-89,9 89, June 17, 1968. 11 refs.

Hydrocrackers are built primarily to produce gasoline from heavy oils, but other product volume and quality demands are influencing the design of new installations. Equipment modifications, feedstock properties, yields, and product properties for various hydrocracking processes are enumerated.

10519

May, Hans and Harry Schuis

A NEW DISTRIBUTING INJECTION SYSTEM AND ITS POTENTIAL FOR IMPROVING EXHAUST GAS EMISSION. Society of Automotive Engineers, Preprint, 10p., 1968. 24 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680093.)

The control principles and the design of a fuel injection system are described. In this system, injection time and injection pressure are controlled independent of each other. The injection time is controlled by two rotating discs having slots, which are turnable to each other and which are turned by the influence of a centrifugal governor in connection with a three-dimensional cam.

With the three-dimensional case, a punctiform scanning of engine characteristics can be realized. Some results obtained with this injection system are shown for example, fuel quantity characteristic, CO and n-hexane characteristic of a 6-cyl 4-stroke engine, injection pressure distribution dependent on crank angle, and consumption loops for injection and carburetor operation. (Authors' abstract, modified)##

10568

Schiele, G.

ELECTRIC CLEANING OF WASTE GASES FROM CARBON ELECTRODE BAKING FURNACES. ((Elektrische Reinigung der Abgase aus Elektrodenbrennofen.)) Text in German. Aluminium 43(3):171-174, March 1967.

Waste gases from carbon electrode baking furnaces contain extremely fine tar vapors with a range of boiling temperatures. These vapors can be precipitated most effectively by means of electrofilters. The gases in many cases must be cooled before tar vapor removal, due to the differences in boiling temperatures; if this step were not taken, the amount of tar vapor reaching the atmosphere would still be too high despite the filter's efficiency. The industrial application of the electrostatic precipitation gas cleaning process is described and illustrated.##

10617

Il'nitskii, A. P., A. Ya Khesina, S. N. Cherkinskii, and L. N. Shabad

EFFECT OF OZONATION UPON AROMATIC HYDROCARBONS, INCLUDING CARCINOGENS. ((Vliyanie ozonirovaniya na aromaticheskie, v chastnosti kantserogennye, uglevodorody.)) Gig. i Sanit. (English translation of: Gigiena i Sanit.), 33(1-3):123-127, Jan.-March 1968. (((1))) refs.
CFSTI: TT 68-50089/1

The efficiency of ozone in the inactivation of carcinogenic hydrocarbons was studied. Experiments were performed with 1,2-benzanthracene (BA), 1,2,5,6-dibenzanthracene (DBA), 9,10-dimethyl-1,2-benzanthracene (DMBA), 3,4-benzpyrene (BP) and pyrene (P) in various concentrations. Ozone concentration was 0.6 g per liter mixture. Ozonation was performed for periods 1, 2 1/2, 5 and 10 min. Results of experiments demonstrated that: carcinogenic hydrocarbons are vigorously destroyed by ozone. Aromatic hydrocarbons vary in their resistance towards ozone, 3,4-benzpyrene appearing to be the most stable. The resistance of a carcinogenic substance (3,4-benzpyrene) to ozone was found to vary according to whether it was in solution or adsorbed on particles of coal, soil, etc.; it was found to be less stable in solution. Ozonation is probably very efficient for the purification of central water supplies containing dissolved carcinogens.##

109267

Ainkeeyeva, R. V., A. S. Ozerskiy, and V. A. Khrustaleva

DECREASING THE CONCENTRATION OF TOXIC EXHAUST FROM AUTOMOBILE ENGINES. ((O snizhenii kontsentratsii toksicheskikh otrabotannykh gazov avtomobil'nykh dvigateley.)) Translated from Russian, Gigiena i Sanit. (Moscow), No. 27:3-7, Dec. 1962. 1 ref.

Automobile engines idling during change of gear, braking, or standing operate in a regime during which the toxicity of exhaust gases increases substantially. This is due to the fuel rich mixture yielding a high percentage of incomplete combustion products. This phenomenon has been studied and an air-fuel ratio regulator was developed which is mounted in the intake line and starts operation automatically when the engine idles. Gas samples with and without the device were analyzed under various operating conditions. Without the device carbon monoxide contents ranged from 3.2 to 7.0% while with use of the device it was only 0.4%. Also the concentration of benzene, acrolein, and formaldehyde decreased substantially. The device was tested on city buses with good results.##

10945

Ali, F. E., P. Datta, W. A. T. Macey, and B. Sessons

REACTIONS OF SULPHUR-CONTAINING HYDROCARBONS IN AN ELECTRICAL DISCHARGE. J. Appl. Chem. (London) 18(7):213-217, July 1968.

A study has been made into the effects of a low frequency semi-corona discharge on carbon disulphide, ethyl mercaptan, amyl mercaptan and thiophene present as 1 - 2% sulphur/hydrocarbon mixtures. Semi-corona discharge, which was carried out at atmospheric pressure, has resulted in the partial desulphurisation of the sulphur-containing hydrocarbon mixtures. The efficiency of the desulphurisation was influenced by the techniques employed and by the nature of the central electrode. In almost all instances the reactions were accompanied by the formation of solid material. (Authors' abstract)##

11011

Gaskie, E. L.

CONTROL OF ORGANIC SOLVENT EMISSIONS IN INDUSTRY. Preprint, Continental Can Co., Inc., Chicago, Ill., ((24)) p., 1968. 6 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-48.)

Extensive and careful source testing is required in order to evaluate a solvent emission pollution problem and to select suitable emission control equipment. When new equipment is considered, the system needs which are based upon a study of the functions to be performed, are determined. Test equipment is

important for appraisal of performance of emission control equipment. For on site testing, the hydrogen flame ionization detector offers a reasonable approach for direct reading instrumentation design. Control methods for limiting the emission of solvents can be classified as Process Modification, Incineration, and Solvent Recovery. Discussion of these methods are given. Pictures and diagrams of control equipment and systems used in the control of organic solvent emissions are presented.##

11058

W. Teske

IMPROVEMENTS IN THE PROCESSES AND OPERATION OF PLANTS IN THE CHEMICAL INDUSTRY LEADING TO REDUCED EMISSION. Staub (English translation), 28(3):25-33, March 1968.
CFSTI: TT 68-50448/3

The emissions from chemical plants can be reduced, in special cases, by changing the production process or, in general, by using a gas cleaning method. Change in the production process may be achieved by a basic alteration of the process itself, by changing the mode of operation, by modifying the equipment and by using a different raw material. For this purpose, the doublecontact method for sulphuric acid production, the pressure method for nitric acid recovery and the introduction of a covered carbide furnace are mentioned as examples. The superphosphate process, viscose process, production of betanaphthol, production of thermal phosphoric acid and production of calcium chloride are given as examples for waste gas cleaning. (Author's summary)##

11238

R. C. Tennies, and H. E. Bachman

FUEL ADDITIVES FOR THE SUPPRESSION OF DIESEL EXHAUST ODOR AND SMOKE. PART I: PROPOSED MECHANISM FOR SMOKE SUPPRESSION. Preprint, American Society of Mechanical Engineers, New York , 8p., 1968. 20 refs. (Presented at the ASME Winter Annual Meeting and Energy Systems Exposition, New York, N. Y., Dec. 1-5, 1968, Paper 68-WA/DGP-6.)

A combination of odor mask and barium containing additive in diesel fuel is effective in reducing smoke, odor and irritation from diesel exhaust. It has shown no injurious effects on fuel systems, exhaust systems or engines. This paper discusses the engine evaluation of these additives in American diesel engines. The major implications of using barium additives in the fuel are discussed as well as possible mechanisms for their action. Of special interest is a description of the results of using the Ricardo, high speed cine technique to visually study the combustion of additive treated fuel. This technique shows in a spectacular way that smoke clearing occurs principally in the combustion chamber. (Authors' abstract, modified)##

11292

EFFECTIVENESS OF EXHAUST CONTROLS ON 1966 VEHICLES. 11p., Aug. 10, 1966. 6 refs. California Motor Vehicle Pollution on Control Board

Emission tests on 404 1966-model cars with exhaust controls in public use confirm that the vehicle manufacturers have done a good job of building cars with low emissions. However, field data on emissions higher than [illegible]ving-ground results and some deterioration of emissions with mileage, indicate that more effort is needed on emission control in the field. (Author's abstract)##

11540

Cantwell, E. N., I. T. Rosenlund, W. J. Barth, F. L. Kinnear and S. M. Ross

A PROGRESS REPORT ON THE DEVELOPMENT OF EXHAUST MANIFOLD REACTORS. Preprint, Society of Automotive Engineers, Inc. New York, 56p., 1969. 22 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690119.)

Exhaust manifold reactor systems using air injection have been developed to control exhaust emission levels of a variety of vehicles to less than 50 ppm hydrocarbons and 0.5 per cent carbon monoxide. These systems have been shown to be compatible with other control systems used to reduce evaporative emissions and oxides of nitrogen. Manifold reactors were constructed which were sufficiently durable to control emissions effectively for 100,000 miles when run in accordance with the mileage accumulation schedule suggested in the Federal emission control device certification procedure. Problem areas hampering immediate application of reactor systems are described. Manifold reactor units are large and will not fit in the engine compartments of many vehicles; furthermore, some current engine configurations are not suited to the installation of reactors. Current reactor construction techniques are costly and materials of proven durability are relatively expensive. In addition, at the present stage of development, some carburetor enrichment is required which results in lower fuel economy. While preliminary work has indicated that these problems are probably amenable to solution such additional development will be required. (Authors' abstract)##

11917

H. Puschenburg

EXHAUST GAS MEASUREMENTS DURING A SIMULATED TRAFFIC JAM IN A ROAD TUNNEL. ((Abgasmessungen bei simuliertem Verkehrsstau in einem Strassenverkehrstunnel.)) Text in German. Stadthygiene, 19(6):109-111, June 1968.

Prior to the opening of the Kiostervall-Glockengrosservall Tunnel, the Hasbury Construction Office for Bridge Construction and Engineering, utilizing 20 diesel trucks and 20 gasoline-powered automobiles (Volkswagens), tested the efficiency of the tunnel's built-in mechanical ventilators and

studied the problem of diminished visibility from diesel exhausts. Schematic drawings of the 55m tunnel with locations of measuring, regulation, and warning instruments are presented. A study was made of the carbon monoxide (CO), nitrous gases, and benzene hydrocarbons in the tunnel atmosphere while the vehicles, standing bumper to bumper, idled for 20 minutes to stimulate the worst possible traffic conditions. Following an initial increase during startup, the CO concentration decreased slightly and thereafter increased to 20 ppm with the diesel trucks after 50 minutes. CO increased to 330 ppm after 25 minutes and 380 ppm after 50 minutes with the gasoline-powered automobiles. Neither the lower explosive limit nor the maximum allowable hygienic concentration was reached for the benzene hydrocarbons. No evidence of any danger from visibility impairment was found. Measurements made at the various measuring stations showed uniform distribution of CO in the tunnel although none of the air turbulence which would have been created by moving traffic was present. The ventilators were able to move the air column towards the tunnel exit. The study shows that continuous surveillance of tunnel air for CO is needed and that automatic installations for measuring and regulating CO and for warning against it are preferred to manual operations.##

12503

Battelle Memorial Inst., Richland, Wash.

APPLICABILITY OF ORGANIC LIQUIDS TO THE DEVELOPMENT OF NEW PROCESSES FOR REMOVING SULFUR DIOXIDE FROM FLUE GASES. (FINAL PHASE I.) Contract PH-22-68-19, (114)p., March 1969. 32 refs.
CFSTI: PB 183511

A study was undertaken, the purpose being to survey the literature and, on the basis of the findings, to assess the applicability of organic liquids to the development of new processes for removing SO2 from fossil fuel fired power plant stack gases. This literature search also extended to the process engineering field to indicate the preferred methods of contacting the sorbent with the flue gas and the preferred technique of sorbent regeneration and recovery of sulfur values. A preliminary assessment of the applicability of organic liquids for cleaning both gaseous effluent and power plant flue gases were made, and conditions required to ensure adequate effluent gas plume dispersion were reviewed. Economic factors important to the comparison of organic liquids as scrubbing agents were reviewed, along with other means of sulfur dioxide removal.

12998

EXHAUST PURIFIERS CLEAN THE AIR. Mater. Handling Eng., 24(8): 108-110, Aug. 1969.

Air inside Armstrong Rubber Company's West Haven, Conn. warehouse is kept clean by using a combination of exhaust blowers and LP gas lift trucks fitted with catalytic mufflers. Three blowers on each of the three storage floors are used to change interior air in the 600,000 sq ft building. The LP gas-fueled lift trucks are fitted with PTX purifiers. Platinum on a special ceramic support catalyzes the oxidation of the CO, hydrocarbons, and exhaust odors into CO2 and H2O vapor. The catalyst lasts thousands of hours without requiring replacement. The purifiers replace the conventional mufflers and work well

with LP gas, white gasoline, or diesel fuel. They warm up in 30 to 45 sec. Zenith Corp. has equipped its seven tractors and 42 lift trucks with Oxy-Catalyst catalytic mufflers. These vehicles are fueled with 87 octane naptha gasoline. Exhaust gases are oxidized into CO2 and H2O as they pass through a bed of catalyst-coated pellets in the purifier. The mufflers require maintenance after 500 to 600 hrs of use. A 90 psi air stream is used to blow off carbon deposits and more pellets are added. After 2000 hrs of operation, the entire catalytic bed is replaced.

13051

Griffing, Margaret E., Frances W. Lamb, and Ruth E. Stephens

METHOD OF CONTROLLING EXHAUST EMISSION. (Ethyl Corp., New York, N.Y.) U.S. Pat. 3,449,061. 4p., June 10, 1969. 5 refs. (Appl. May 11, 1966, 10 claims).

A method is presented for reducing unburned hydrocarbons, carbon monoxide, and nitrogen oxides of the exhaust gas from internal combustion engines operating at an air/fuel ratio of 15 by contacting the exhaust gases with oxygen, ammonia, and a catalyst. Additional oxygen is first injected into the exhaust stream. Ammonium carbonate is added and vaporized to ammonia by the heat of the exhaust gases. The ammonia, oxygen, and exhaust gases are then contacted with the catalyst at a temperature between 600 and 800 F. The catalyst consists of an alumina support impregnated with 0.001 to 25 wt % copper oxide and with 0.001 to 1 wt % palladium.

13036

Innes, William Beveridge

CATALYTIC MUFFLER. (American Cyanamid Co., Inc., Stamford, Conn.) U.S. Pat. 3,459,006. 4p., June 10, 1969. 5 refs. (Appl. Sept. 22, 1966, 1 claim).

A catalytic muffler for the control of hydrocarbons emitted in internal combustion exhaust gas is presented. The muffler is of simple construction, readily adaptable for positioning in the exhaust line and is designed to minimize the destructive fluidization of the catalyst particles which has been prominent in previous catalytic mufflers. This catalytic muffler is of the radial type with the annular catalyst located between a central foraminous gas-distributing pipe and an outer cylindrical retaining sleeve. Fluidization of the catalyst is prevented by having an unperforated retaining sleeve cap.

13168

Stephens, Ruth E., Daniel A. Hirschler, Jr., and Frances W. Lamb

OXIDATION CATALYSTS. (Ethyl Corp., New York, N. Y.) U. S. Pat. 3,607,031. 8p., June 1, 1969. 7 refs. (Appl. Feb. 8, 1966, 8 claims).

In purification of exhaust gases from an internal combustion engine, a catalyst must operate effectively under a range of temperatures from 400 to 1800 F. A method is presented for oxidation of the unburned hydrocarbons and the carbon monoxide components of exhaust gas. The exhaust gas is contacted with a catalyst consisting of a transitional alumina support containing from 0.01 to 5 wt % silica, and as a catalytic agent, copper oxide containing 0.5 to 25 wt % copper and 0.5 to 10 wt % cobalt or silver and a combination of cobalt and vanadium in oxide form. The catalyst will operate at the required range of temperatures, oxidizing the carbon monoxide and unburned hydrocarbons.

13217

Mattia, Manlio M.

PROCESS FOR REMOVING ORGANIC CONTAMINANTS FROM AIR. (Day & Zimmermann, Inc., Philadelphia) U. S. Pat. 3,455,089. 4p., July 15, 1969. 3 refs. (Appl. Nov. 27, 1967, 4 claims).

A process is presented for removing organic contaminants from air by adsorption. This is accomplished in a continuous process by using several parallel adsorbers, with one or more of the units being regenerated while one or more remain on stream. Contaminants driven from the adsorbers during regeneration are used as fuel for heating the regenerating gases. Adsorbent beds, such as activated charcoal, that normally are adversely affected by the very high temperatures associated with direct burning can be used in the system. Combustion products are preferably recycled through the adsorber so that only treated exhaust leaves the system.

13267

Young, Stewart W.

FUME DESTROYING PROCESS. (Thiogen Co., San Francisco, Calif.) U.S. Pat. 3,499,737. 3p., April 28, 1970. (Appl. August 15, 1911, 5 claims).

Decomposition or reduction of sulfur dioxide and formation of sulfur occur simultaneously when sulfurous fumes are subjected to the action of a heated carbonaceous fuel in the presence of a calcareous substance or solid reagent, or the action of a highly heated hydrocarbon fuel in the presence of a reagent. Fumes are then cooled to a temperature at which the sulfur will not recombine with oxygen. Decomposition is accelerated by the use of lime, lime rock, or any substance which has the property of neutralizing the sulfurous acid of the fumes.

13297

Saito, T., K. Shiraoki, and H. Toriyama

STUDIES ON SULFUR IN ACETYLENE GAS GENERATED BY DRY TYPE GENERATORS AND METHOD OF GAS PURIFICATION. Text in Japanese. J.J. Synthetic Organic Chem. (Japan), 27(4):345-351, April 1969. 7 refs.

This study involved the removal of sulfur components from acetylene by washing with dilute sodium hypochlorite. Crude acetylene generated from calcium carbide containing more than 1% calcium sulfide contained a small amount of hydrogen sulfide. Alpha, beta, alpha prime, beta prime-tetrachlorodiethyl sulfide was extracted after purification of the precipitates in the mist separator using a solution of pH 6.5-7.5. Hydrogen sulfide was effectively removed by washing crude acetylene with 10% aqueous NaOH before treatment with sodium hypochlorite.

19591

Faith, W. L.

AIR POLLUTION ABATEMENT. SURVEY OF CURRENT PRACTICES AND COSTS. Chem Eng. Progr., 55(3):38-43, March 1959. 8 refs.

Pollutants and control methods of the chemical manufacturing, pulping, petroleum refining, steel, food, and cement manufacturing industries are reviewed. Chief pollutants from the chemical industry are dilute vent gases, acid mists, waste sulfides, nitrogen oxides, combustible wastes, and dust. Vent gases are best controlled by catalytic oxidation, sulfides by caustic scrubbers, nitrogen oxides by catalytic reduction, combustible wastes by incineration, and dust by filtration. No standard procedure has been adopted for abatement of acid mists. Pulp and paper industry pollutants are fly ash, dust and odors. Electrostatic precipitators, dust scrubbers, and spray towers are used to combat these problems. Air pollution by the petroleum refining industry is caused by sulfur compounds and hydrocarbon loss. Sulfur compounds can be reduced by absorption and hydrocarbons by several control methods. The main pollutant from the steel industry is dust, which can be controlled by electrostatic precipitators and wet scrubbers. The main problem of the food industry is control of odor, which is combatted by activated carbon absorbers. Dust from cement industries is best controlled by glass fabric bag filters or cyclone collectors. Costs for 1959 are given for the various control methods.

19594

Cohn, Johann G. E.

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Engelhard Industries, Inc., Newark, N. J.) U. S. Pat. 3,118,727. 4p., Jan. 21, 1964. 5 refs. (Appl. Oct. 12, 1956, 11 claims).

A process is described for recovering heating values and purifying waste gases produced by the oxidation of ammonia in the production of nitric acid. Waste gases are mixed with a hydrocarbon fuel and the mixture is passed over a 0.1 to 5.0% by weight rhodium and/or palladium supported catalyst at the reaction temperature of 700-725 F. The heat generated in passing the mixture over the catalyst may be used to raise the gas temperature or to generate steam isothermally. Space velocity for the reaction may be in the range of 60,000-110,000 standard vols of gas/vol of catalyst/hr. The more hydrocarbon fuel used, the more complete is the removal of nitrogen oxides.

11783

Miller, E. B.

ADSORPTION BY SILICA GEL. II. Chem. Met. Eng., 23(25):1219-1222, Dec. 22, 1920. (Presented before the Am. Inst. Chem. Eng., Montreal, June 28, 1920).

The most satisfactory method for recovering solvent vapors after they have been adsorbed by silica gel, consists of heating the gel and sending steam directly through it. For volatile solvents such as ethyl ether, acetone, benzene, and gasoline, 150 C is considered the optimum temperature to bring about rapid distillation of the vapors from the gel. It was found that using a 1% mixture of ether vapor and air, silica gel adsorbs an amount of ether corresponding to 14.4% of its own weight; and, using a 3.00% mixture, it adsorbs 15.5% of its own weight. In each case it adsorbed at 8% of its weight at 100% efficiency. The results of experiments conducted on the adsorption efficiency for acetone, benzene, and petroleum ether are presented graphically.

11788

Hessen-Jaschin, Gregori

APPARATUS FOR PURIFYING AIR. (G. A. Hessen-Jaschin, Sarnen, Switzerland) U. S. Pat. 3,439,267. 7p., March 25, 1969. 20 refs. (Appl. Sept. 1, 1965, 9 claims).

An installation for purifying street air from automotive exhaust gases is described. A number of electrofilters are located in two rows on opposite sides of the street below the street level. Ventilators suck in the air to be purified from the streets and pass it through the electrofilters. After the air passes through the filter, it is guided through a combustion chamber where carbon monoxide is converted to carbonic acid. The apparatus has a separate air-withdrawing channel connected to each combustion chamber which opens into the side wall of a discharge gutter.

11865

Schuetze, H.

FINE PURIFICATION OF GASES WITH A HIGHLY ACTIVE COPPER CATALYST. (Feinreinigung von Gasen mit einem hochaktiven Kupferkatalysator). Text in German. Angew. Chem., 70(22-23):697-699, Nov. 28, 1958. 7 refs.

A description is given of a novel, highly active copper catalyst which is suitable for removal of O2, H2, CO, acetylene, and sulfur compounds from a large variety of gas mixtures by catalytic reaction or by absorption. The impurities are removed at relatively low temperatures, in most cases, down to the limit of detectability.

19958

Agnew, W. G.

FUTURE EMISSION-CONTROLLED SPARK-IGNITION ENGINES AND THEIR FUELS. Proc. Am. Petrol. Inst. Sect. III, Vol. 49:242-280, 1969. 26 refs.

Future trends in vehicle and gasoline design for the purpose of meeting increasingly stringent air pollution controls are discussed. Federal exhaust emission standards for 1970 are more stringent than those for 1969. Standards now require 10% lower hydrocarbon and CO emissions and measurement methods have been changed from a concentration basis to a calculated mass basis. Emission control systems are improved and are integral with the power plant and the fuel system. Included in future plans are evaporative emission restrictions, nitrogen oxides emission control, and more stringent hydrocarbon and CO emission controls. New devices available for control include large manifold air injection reactors, catalytic converters, and alternate power plants such as gas turbines, external combustion engines, and electric propulsion. Attention will be given to reducing the extreme deviations of high volatility gasolines in the summer and low volatility gasolines in the winter and reducing eye irritation by reducing the amount of aromatic hydrocarbons in the engine exhaust gas. Propane may be used since it permits leaner mixtures. While emission standards are met, companies will try to maintain or improve present levels of driveability, reliability, fuel economy, cost, and owner convenience. At the same time, the oil industry will be making necessary changes to ensure that the new hardware systems will operate with the greatest possible satisfaction to the car owner.

19894

Franeky, Ulrich

COUNTERACTING OFFENSIVE ODORS CAUSED BY ORGANIC COMPOUNDS. (Bekaempfung von Geruchsbelaestigungen, die durch organische Verbindungen verursacht sind). Text in German. Staub, Reinhaltung Luft, 28(3):113-119, March 1968. 13 refs.

The importance of removing odorous components from waste air and exhaust gases is now recognized, but the selection of an appropriate purification process is complicated by the proliferation of chemical processes and treatment methods. A survey of the most popular methods is given and measures that can be taken to improve conditions in a small plant are pointed out. (Author summary modified)

19029

FILTRATION OF WASTE AIR FROM DRY CLEANING MACHINES. (Filterung der Abluft aus Reinigungsmaschinen). Text in German. Wasser Luft Betrieb, 13(4):127-128, April 1969.

The fifth regulation of the law for the Prevention of Air Pollution in North Rhine-Westphalia of 1967 is now in effect. It concerns all machines for cleaning and drying textiles, leather

goods, or furs if they operate with chlorinated hydrocarbons in the form of trichloroethylene or perchloroethylene. The regulations pertain to all sizes of machines so that tumble driers and coin-operated cleaners are also affected. In a departure from other regulations, a specific method for cleaning of the waste air is required, namely, filtration with activated coal. The concentration limit cannot exceed 200 mg of solvent per cu m waste air. Commercially available activated coal is capable of storing 25 to 35% more solvent than must be regenerated. For this reason, installation of two filters is recommended. The efficiency of a charcoal filter is rather high, so lower concentrations than the prescribed limit concentration are obtained. Since the odor threshold of trichloroethylene fluctuates between 260 and 520 mg/cu m and that of perchloroethylene is 160 mg/cu m, the effectiveness of the filter can be roughly evaluated by the presence or absence of odor at the filter outlet. According to the regulations, official inspections will be made once a year without charge. For this purpose, the Dräger trace gas-measuring unit will be used. The solvent retained by the activated coal can be recovered and returned to the process. Investment costs should be amortized within two years.

14016

Taylor, R. E. and R. M. Campau

THE IIEC - A COOPERATIVE RESEARCH PROGRAM FOR AUTOMOTIVE EMISSION CONTROL. Proc. Am. Petrol. Inst., Sect. III, vol. 49:309-327, 1969. 5 refs.

The Inter-Industry Emission Control Program, which now is comprised of six petroleum companies and five automobile manufacturers (including four foreign firms), was established in 1967 and expanded in 1968 to pool the research efforts of the two industries in the design and development of a virtually emission free, gasoline-powered vehicle. Specific targets call for a 90 to 97% reduction in the hydrocarbon, carbon monoxide, and nitrogen oxide emissions of a typical vehicle and are aimed at improving the quality of the Los Angeles Basin, considered the most critical air shed area in the United States. Of some 17 research projects begun under the program, those associated with catalysts, thermal reactors, exhaust gas recirculation, and modification of fuel properties are receiving the major current attention, using techniques ranging from mathematical modeling to component hardware development and testing, to the building and testing of complete concept cars, which combine various emission control sub-systems into fully-functioning automobiles for total emission evaluation, durability testing, and product acceptability evaluation. Descriptions of the various research problems and methods are given. Because of Federal emissions testing requirements, much of the total effort is directed toward designing exhaust control systems that can operate at high efficiency almost from the moment of engine start-up. Summaries are given of the investigations underway that deal with the fuel and hardware components of a spark ignition engine; these involve the development of additives to suppress nitrogen oxide formation, hydrocarbon combustion-improving additives, hydrocarbon deposit-modifying additives, surface tension and emulsifying agents, and the study of the effect of fuel volatility on exhaust and evaporative emissions.

16191

Saito, Takeshi

AUTOMOBILE EMISSION AND MOTOR OILS. (Dorogai ecko sharyo ni saitehi no sekyu tenka zai). Text in Japanese. Junkatsu (J. Japan Soc. Lubrication Engrs.), 14(2):61-69, 1969. 11 refs.

Exhaust gas, blowby gas, and carburetor vapors constitute automotive emissions. A Positive Crankcase Ventilator (PCV) recycles carbon monoxide- and hydrocarbon-containing blowby gas from the crankcase to the cylinder. A 'road draft system' results when there is no recycle. A high grade motor oil, e.g., 'long life', is necessary to prevent the PCV tube from becoming filled with sludge and the PCV bulb should be a 'sigle' pin type. The motor oil test is discussed at length and the sludge characteristics of a new oil are evaluated on the basis of its total alkali number.

16202

Bjorklie, J. W. and B. Sternlicht

CRITICAL COMPARISON OF LOW-EMISSION OTTO AND RANKINE ENGINES FOR AUTOMOTIVE USE. Preprint, Society of Automotive Engineers Inc., New York, 16p., 1969. 16 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690048.)

Rankine cycle external combustion engines, which are currently used for low emission power plant systems, are considered in terms of their application to automobiles meeting future pollution requirements. A comparative study of theoretical reciprocating and rotary Rankine cycle engines using steam and organic fluids with existing Otto automotive engines indicates that the performance of the former should be superior with respect to size, torque, economy, emission, response, maintenance, and reliability. Use of external combustion, which means that the engine can use the same fuel burned in power plants, will reduce fuel cost and produce inherently lower emissions. With presently available fluids and with the most practical machinery presently known, the steam reciprocator is best able to compete with the Otto cycle engine. However, development of an 'ideal' low temperature, nontoxic, nonflammable fluid should lead to vapor engines significantly better than the reciprocating steam engine. These engines will require no regenerator or superheater and will not have the cost and size disadvantage of the steam system. Reciprocating vapor engines will develop very high torque merely by feeding high pressure vapor to the cylinder. It is hoped that chemical and petrochemical companies will concentrate on the development of the 'ideal' fluid.

16264

Eberenle, G. D.

HYDROCARBON REACTIVITIES OF MOTOR FUEL EVAPORATION LOSSES. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1969. 12 refs. (Presented at the International Automotive

Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690089.)

A calculation technique that accounts for nonlinear relations between reactivity and mixture concentration was developed and used to study the hydrocarbon reactivity of evaporation losses from a variety of original fuels. Results of calculated data show that diluting the concentration of light olefins in an original fuel, normally accomplished by additions of butane, pentane, or saturated base stocks, reduces reactivities of hydrocarbon evaporation losses. It was concluded that the effects of fuel composition on evaporation losses is a parallel study needed for complete assessment of the benefits that changes in fuel composition may have on photochemical smog formed from the evaporation losses.

16297

Hind, E. J.

CLEAN AIR AND THE DIESEL. Indian Eastern Engr. (Bombay), 111(2):77-79, Feb. 1969.

A defense of the diesel engine against criticism that it is a heavy contributor to air pollution is presented. Under ideal conditions if all gasoline engines were replaced by diesel engines, the emission of carbon monoxide, aldehydes, and nitrogen oxides would be reduced, carbon dioxide, hydrocarbons, and soot would be increased, and sulfur dioxide would be unchanged. Carbon dioxide is not seen as a health hazard, and hydrocarbons are not considered dangerous, as they are in parts of the U. S., because the other conditions necessary for the creation of photochemical smog, particularly climatic factors, are not present in the U.K. Carbon monoxide, possibly the emission most hazardous to health, would be reduced to almost negligible amounts. Sulfur dioxide would necessarily be kept to a minimum, since in diesel engines the sulfur content of the fuel is deliberately kept very low to reduce internal corrosion of engines. In addition, because the diesel engine is more efficient than the gasoline engine, the absolute quantity of fuel oil used would be reduced, thus lowering the total impurities discharged into the atmosphere. Efforts are underway to reduce the major pollutants from diesels: smoke (carbon) and odor (sulfur dioxide). Supercharging by making use of energy remaining in the exhaust gases to drive a turbine and compressor, is seen as one way of maintaining a satisfactory fuel/air ratio for smokeless operation and greater efficiency as fuel input is increased. Improvements in the combustion process are being investigated as an engineering goal and to reduce odorous emissions.

16124

Hardison, L. E.

A SUMMARY OF THE USE OF CATALYSTS FOR STATIONARY EMISSION SOURCE CONTROL. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 271-296.

Catalysts have been used for about 20 years for oxidizing hydrocarbons to prevent their emission into the atmosphere. Initially, all-metal catalysts of the Sutor-Ruff type, in which the active catalytic material is conducted to the surface of a base metal support by means of an electrochemical process were used; they were most commonly of the platinum-palladium group. These continue to be the most widely used catalysts for stationary source control, but ceramic honeycomb-supported and particulate-supported catalysts have had significant application. Particulate catalysts are widely used in petroleum refining and chemical processes, and to a limited extent in air correction. Ceramic honeycomb materials have an advantage over particulate catalysts in that the pressure drop for a given amount of ceramic surface area is only a very small fraction of that across the particulates. While the scientific basis of catalysis is not as clear as that of many of the other industrial arts, the thermodynamics are sufficiently well known that catalysts can be characterized with good success. A summary of the thermodynamic reactions involved in catalysis is given. The use of catalytic air pollution control equipment in such industries as wire enameling, kettle cooking (particularly in paint manufacturing), metal lithographing, the chemical process industries and many others is described. Additional applications for catalytic air pollution control continue to appear as regulations and community standards for air quality become more rigid. An appendix presents a sample computer analysis of catalytic solvent burning.

14333

Beyer, F. G.

CATALYST SYSTEM MORPHOLOGY AND DESIGN. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C.; National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 73-88. 13 refs.

Common gaseous pollutants that are amenable to catalytic transformation are discussed. Sulfur dioxide is eliminated by catalytic hydrodesulfurization, oxidation with a vanadium pentoxide catalyst, or reduction with carbon monoxide in flue gases. Nitrogen oxides are eliminated by reduction with chromite and copper oxide catalysts, which lose their effectiveness. Carbon monoxide is removed from atmospheric gases by catalytic oxidation. More is known about the mechanism of CO oxidation, which is catalyzed by transition metal oxides and noble catalysts, than about any other methods. Carbon monoxide also can be oxidized in the presence of H2 over MnO2, and indium doped SnO, based on electronic charge transfer. Mechanisms for the oxidation of hydrocarbons are similar to those for CO oxidation but more catalyst efficiency. Interaction of gaseous pollutants presents a problem in finding the right catalyst. The complexity of the problem is seen in the exhaust from internal combustion engines. Here, CO and unburned hydrocarbons are converted by catalytic oxidation and nitrogen oxides are converted by catalytic reduction. The transition metal oxide and noble metal catalysts must be supported on a base for ease of handling, cost, and thermal stability. Problems encountered in treating industrial gas streams are those of dilution. A

further complication arises if the diluent interferes in some manner with the reaction being catalyzed. Poisoning effects, which are present in all heterogeneous catalytic reactions, must also be considered. Although none of the catalysts is a panacea, each brings the solution of air pollution closer.

14161

Lunche, Robert G.

FUME AND ODOR DESTRUCTION BY CATALYTIC AFTERBURNERS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 297-320. 6 refs.

The operating and design aspects of the catalytic afterburning process are reviewed, and its application and effectiveness are discussed on the basis of the experience of the Los Angeles County Air Pollution Control District in testing a wide variety of catalytic afterburners in industrial use. Because of certain operating characteristics of these afterburners, they represent a partial oxidation process which produces compounds in the treated effluents that are often more offensive and odorous than the original fumes and odors. Investigations by the District show that partial oxidation produces aldehydic and other oxygenation products that often increase the eye-irritating, photochemical smog-forming potential of treated effluents to levels greater than those of the original fumes and odors. In general, an afterburner must oxidize 90% or more of the carbon in the entering materials to CO2 to be judged effective. On the basis of the District's own experience and reports of others, the actual performance of catalytic afterburners for reducing many fumes and odors is considered inadequate. Without an advance in performance, it does not seem likely that catalytic afterburners will be able to comply with Los Angeles County's organic emissions standards unless the operating temperatures are at a level that renders the catalyst unnecessary.

14151

Yagi, Shigeo, Kazuo Nakagawa, Akira Ishisuya, and Yasuhito Sato

A STUDY IN THE DEVELOPMENT OF EXHAUST EMISSION CONTROLS FOR SMALL DISPLACEMENT HONDA ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1968. 11 refs. (Presented at the West Coast Meeting, Society of Automotive Engineers, San Francisco, Aug. 12-15, 1968, Paper 680527.)

In the small displacement, high-speed, high-performance spark ignition engines being developed by Honda, the difficulties in reducing exhaust emissions without seriously impairing inherent engine characteristics are different from those encountered with the large displacement engines generally used in American cars. The tandem throttle valve system was developed as a control device to minimize exhausts emissions during the frequent accelerations and decelerations in normal driving conditions. The system serves to restrict the flow of fuel from the low-speed system of the carburetor, to prevent fuel remaining on the intake manifold wall from flowing into the

cylinders, and to aid the fuel not restricted from flowing into cylinders to burn completely by adding secondary air. The application of an air injection reactor system in small displacement engines reduced carbon monoxide and hydrocarbon concentrations. The effect of 'squish action' in a hemispherical combustion chamber on exhaust emissions promotes better mixing of the gases, thereby increasing the flame speed and resulting in more complete combustion in the cylinder. Through research and development, many of the difficulties were overcome, and satisfactory results were obtained in exhaust emission control under certain limited operating conditions.

14424

Masse, Victor F. and George P. Gross

METHOD AND APPARATUS FOR TREATING AUTOMOTIVE EXHAUST GAS. (Esso Research and Engineering Co., Inc., Linden, N. J.) U. S. Pat. 3,460,901. 3p., Aug. 12, 1969. 6 refs. (Appl. June 11, 1965, 2 claims).

The invention provides a method for abating air pollution from automobile exhaust gas. It is concerned primarily with lowering the emission of unburned hydrocarbons and carbon monoxide by addition of an oxidation-initiating compound of aqueous hydrogen peroxide which promotes the conversion of the pollutants to innocuous CO2 and H2O. The liquid oxidant can be aspirated into exhaust gas for afterburning or injected in other ways suitable for dispersing it in carrier gas or directly in exhaust gas ports. An example of a device used for aspirating comprises a venturi scrubber and jet stream. This device can be adjusted to vary the amount of the oxidant in response to engine demand. The carrier gas in which the hydrogen peroxide-water mixture is dispersed can be air or recycled exhaust gas. By a simple valve mechanism, flow of the oxidant can be controlled and limited to periods of engine operation when unburned hydrocarbon emission tends to be highest, e.g., acceleration, deceleration, or idling. The system described can be used with both spark ignition and compression ignition engines. Further applications of the method include the treatment of exhaust gases containing lead residues or halogen compounds present in antiknock additives.

14459

Weaver, E. E.

EFFECTS OF TETRAETHYL LEAD ON CATALYST LIFE AND EFFICIENCY IN CUSTOMER TYPE VEHICLE OPERATION. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1969. 10 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690180.)

Effects of four levels of tetraethyl lead (TEL) on the efficiency and life of a commercially available hydrocarbon and carbon monoxide catalyst were investigated. The four fuels used in mileage accumulation were the base indolene with no added lead and blends containing respectively 0.5, 1.5, and 3.0 ml TEL per gallon. The vehicles were eight Fords equipped with 289-CID non-emission controlled V-8 engines, unmodified except for a lean carburetor and the catalytic exhaust system. The

eight vehicles were paired off and each pair operated on one of the four fuel blends. In each pair, a radial flow converter, which required no supplemental air, was located under the front seat in one vehicle and near the rear axle in the other vehicle. Exhaust emissions were monitored at approximately 3000-mile intervals during accumulation of 18,000 miles in customer-type service. Tetraethyl lead in the fuel adversely affected the rate of warm up, the ability of the catalyst to remove hydrocarbons from the exhaust, and accentuated the differences in performance between front and rear converters as mileage was accumulated. On non-lead fuel, the catalyst performed well in preferentially removing olefins and aromatic hydrocarbons to yield an exhaust of very low reactivity, until problems were encountered with losses of catalyst. The catalyst removed CO, aliphatic aldehydes, and acetylenes equally well on leaded or non-leaded fuel. (Author abstract modified)

14461

Nelson, Edwin E.

HYDROCARBON CONTROL FOR LOS ANGELES BY REDUCING GASOLINE VOLATILITY. Preprint, Society of Automotive Engineers, Inc., New York, 24p., 1969. 20 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690087.)

Evaporative emissions from automobiles can be reduced by lowering gasoline volatility. A 1 psi reduction in Reid vapor pressure will reduce evaporative losses by about 50%. A test program was conducted to determine if new and used cars presently on the road in the Los Angeles basin could operate satisfactorily on lower volatility gasoline. A 12% decrease in total vehicle hydrocarbon emissions, equivalent to 220 tons of hydrocarbons per day, could be obtained by lowering the Reid vapor pressure by 1 psi. Gasoline with reduced volatility gave acceptable driveability and could be used to provide a significant reduction in hydrocarbon emission.

14505

Hartitaton, Nicholas J. and Phillip D. Harvey

SULFUR RECOVERY. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,463,611. 9p., Aug. 26, 1969. 8 refs. (Appl. May 1, 1967, 11 claims).

The invention presents an economical method of manufacturing sulfur from hydrogen sulfide and other sulfur compounds present in the oil fed to a hydroconversion process. It produces a sufficiently high ratio of hydrogen sulfide to inert gas (usually carbon dioxide) to recover sulfur by the Claus process. A purge stream is withdrawn from a hydroconversion zone recycle gas stream containing hydrocarbons, hydrogen, hydrogen sulfide, and other gases. The purge stream is then passed to a partial oxidation zone where hydrocarbons are partially oxidized to hydrogen, carbon monoxide, and carbon dioxide. Hydrogen sulfide and carbon dioxide are removed from the partial oxidation zone effluent and fed to the Claus process. Hydrogen and carbon

monoxide present in the oxidation zone effluent are recycled to the hydroconversion zone. Separation of the hydrogen sulfide and carbon dioxide in the partial oxidation zone is accomplished economically by a physical absorption process at 500-2000 psig.

14519

Fryzinger, Galen R.

HYDROGEN REFORMING FOR FUEL CELLS. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 459-476.

Fuel cells are basically reactors of hydrogen and oxygen. They are being considered for use in hydrocarbon-air fuel cell engines which may have better pollution characteristics than conventional engines. Since oxygen is readily available, the problem is one of converting liquid hydrocarbons into hydrogen fuel with lightweight equipment. Direct anodic oxidation is not practical because of the amount of platinum catalyst required. Another approach to hydrocarbon reforming is based on the internal reforming cell in which the catalyst is located next to a silver-palladium anode in the fuel cell. This anode transmits the hydrogen formed in the reformer cavity directly to the fuel cell where it is oxidized electrochemically on an electrolyte. Hydrogen formation depends on current density of the fuel cell, which is reduced by catalyst degradation. However, desulfurization cartridges should protect reformers against excessive catalyst degradation. High reliability in fuel cell systems is achieved by feeding fuel and water through digital injection systems rather than through stroke piston pumps. Fuel cell reactions using hydrogen and oxygen are clean, since water is the only offgas product. Even using a hydrocarbon fuel, these cells will enable 1980 emission standards to be met.

14604

Hamblin, H. J. J. and W. J. Faust

CATALYTIC SYSTEMS FOR LEADED AND UNLEADED GASOLINE EXHAUSTS. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 131-159.

The problems of achieving complete catalytic combustion of oxidizable components other than unburned hydrocarbons, carbon monoxide, and nitrogen oxides are discussed. A catalyst placed in the exhaust system must be capable of dealing with lead, halogens, sulfur, and phosphorus in all combinations with oxygen and with each other. The catalyst must have a size and shape consistent with requirements for good flow distribution and low pressure drop. The catalyst bed itself and the individual particles must also not be subject to plugging by particulate matter. A catalytic converter lowers the

concentrations of all pollutants in the exhaust gas stream and does not manufacture any new ones. The automobile manufacturers achieved significant reductions in carbon monoxide and hydrocarbon emission levels by controlling carburetion and ignition and by adding secondary air to the exhaust system. However, the still lower levels of emission desired after 1970 will be difficult to attain without further losses in vehicle performance. They may even be unattainable without catalytic converters. The use of present-generation catalysts may permit the recovery of the performance that already is sacrificed by engine modifications. The development of catalysts which can operate successfully for extended mileage on leaded fuels was accomplished. The performance of catalysts on unleaded fuels is outstanding. With leaded or unleaded fuel, a catalytic converter coupled closely to the exhaust manifold, under any engine operating conditions, assures lower emission levels than any other system.

14008

DeFalco, T. V. and R. W. Perga

DIESEL ENGINE POLLUTANTS. PART II. CONTROL. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 221-234.

A catalytic system to control diesel engine pollutants is discussed. Catalytic oxidation of pollutants to carbon dioxide and water is the most desirable method to use. Several catalysts accomplished the task of odor improvement and reduction of gaseous combustibles; these are made of spherical alumina-base materials, one of which contains a noble metal. The real advantage to the solution of the environmental pollution problem by catalysis is its operational persistence. It not only oxidizes odorous oxygenates but also efficiently consumes other combustibles such as carbon monoxide and hydrocarbons. Converter and catalyst design criteria are based on maximum throughput from the engine. Space and mass velocity are selected to give high pollutant conversion even with maximum exhaust gas output. Gas flow distribution must be controlled so that catalyst utilization is complete. This is accomplished by designing low pressure drop beds, minimizing head losses, and balancing velocity and static heads within the converter. The design problem becomes critical when one understands that an exhaust pollution control system must operate under a very wide range of conditions. Engine characteristics also affect the performance of a catalytic system. The two-stroke diesel engine, when compared to the four-stroke engine, exhausts a greater volume of gases which are lower in temperature and more dilute. These conditions diminish the reaction rate for oxidation and make conversion of pollutants more difficult. System design changes in the inlet screen have eliminated the sooting of the catalyst in that area. The need for rapid and accurate evaluation of exhaust gas odorants is obvious. From the catalyst development standpoint an accurate appraisal method is necessary in order to demonstrate subtle differences in performance. A catalytic system was developed which reduces odor emissions from diesel

powered vehicles, which oxidizes hydrocarbons and carbon monoxide with high efficiency, and which can be fitted into existing muffler spaces.

14809

McLouth, G. F.; H. J. Paulus, and A. J. Roberts

INCINERATION OF EPOXY GLASS LAMINATES TO RECOVER PRECIOUS METALS. American Society of Mechanical Engineers New York Incinerator Div., Proc. Natl. Incinerator Conf., New York, 1968, p. 171-175. (May 5-8).

Recovery of precious metals from electrical circuits printed on epoxy-impregnated fiberglass laminates was carried out by incineration of the scrap and rejected printed circuits at controlled temperatures, which resulted in the liberation of a considerable amount of unburned hydrocarbons and obnoxious odors into the atmosphere. The glass laminates consisted of approximately 65% fiberglass (by weight) and 35% epoxy resins. The material contained no chlorines and not more than a trace of sulfur, but 16% petro-bromo had been added to the resins to permit the use of the final product under various ambient temperatures. In addition, there was variance in type and consistency of the epoxy scrap. Based on information obtained by research on the combustion characteristics of the material, a prototype unit was constructed and tested. After successful testing of the prototype unit, a new incinerator was installed that solved the problem of hydrocarbon and odor emission. A control system was designed that should assure proper burner operation and unit temperatures and at the same time be flexible in case adjustments become necessary in the new unit. The new incinerator simplifies recovery of the precious metals due to more consistent ash quality. Polyesters and other plastics, as well as wool and vinyls have been burned in this incinerator, all with equal success.

14723

Berndinger, Hans-Otto

MOTOR VEHICLE ENGINES. (Kraftfahrzeugmotoren). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 110(21):978-982, July 1968. 8 refs.

Recent developments in the field of exhaust gas cleaning are discussed. Since the passage of laws in the U. S. A. limiting the concentrations of carbon monoxide and of unburned hydrocarbons in the engine exhausts, automobile manufacturers have developed various methods of meeting these legal requirements. Most of them are based on the principle of afterburning, e.g., manifold air oxidation and thermal reactors. The Clean Air Package aims at accurate adjustment of the carburetor and delays the ignition, guaranteeing a more complete combustion, although the exit gases have higher temperatures. Another method is gasoline injection. The effects of these measures are beginning to be felt. In Los Angeles, the steep increase in hydrocarbon emissions has been reversed. Great efforts are being made to reduce the emissions by 1980 to the 1960 level. To achieve this end, further

measures are required. Control measures tend toward a smaller ratio of combustion chamber surface to combustion chamber volume. Careful sealing will eliminate the emission of unburned hydrocarbons from the fuel tank evaporation. The two toxicants which have received little attention to date by legislators are lead and nitrogen oxides. In conclusion, the marketing of two new Wankel engines is mentioned.

14728

Krynitsky, John A.

MILITARY PROCUREMENT PROBLEMS RESULTING FROM AIR POLLUTION CONTROLS. Preprint, National Petroleum Refiners Association, Washington, D. C., 11p., 1968. (Presented at the National Fuels and Lubricants Meeting, New York, N. Y., Sept. 11-12, 1968, FRL-68-61.)

The efforts of the Department of Defense (DoD) to comply with Federal and local air pollution control regulations are coordinated by its Environmental Pollution Control Committee, established in January, 1966. As an example of these efforts, to comply with Rule 68 of the Los Angeles Air Pollution Control District which severly restricts the emission of organic materials to the atmosphere and involves many paints and cleaners used by DOD installations and contractors, substitute fluids and solvents are being sought and catalytic incinerators for destroying the vapors are being employed. A time-phased 5-year program for compliance is now in effect. The Department, which may be the biggest buyer of heating oil in the world, is also greatly affected by standards for Federal facilities limiting the emission of pollutants from the burning of fossil fuels. These include limits on particulate emissions, on the visual density of smoke, on vapor losses from gasoline and other volatile organic materials, and on sulfur oxide emissions. Efforts are being concentrated on obtaining adequate supplies of low sulfur heavier burner fuel oils. DOD has adopted a policy of converting to fuel of 1% sulfur content as soon as practical in order to comply with or surpass all local regulations and provide leadership in pollution control. A program to monitor the quality of fuels being received from suppliers is in operation. Five-year plans covering 313 military installations in the three service branches have been drawn up for the phased and orderly correction of air pollution deficiencies, and are now under review.

14757

Heiles, Leonard

WEB PRINTERS AND AIR POLLUTION CONTROL. Web Printer, 1(6):1-7, 1969.

Air pollution from web printing plants consists mainly of a smoke problem, which is relatively simple to control with afterburners, and an odor problem, which presents considerable control difficulties. The most practical means of counteracting odors from paper coatings, ink solvents, improperly adjusted gas burners, and soiled papers is by either catalytic or thermal combustion. The first works best with a pure gas stream from the press dryer; in practice, however, the effluent of a press dryer may have

impurities which can cause trouble with the catalyst and must therefore be considered when the system is designed. Direct flame combustion can handle impurities in the dryer effluent since its temperature range is from 1000 to 1600 F. The initial cost of a catalytic afterburner system is higher than that of a thermal system, but its operating costs are usually considered lower, although recently there has been some controversy on this point. The possibility of controlling pollution by using mild and low aromatic solvents is briefly discussed; the inks now used in such presses contain photochemically-reactant hydrocarbon solvents which violate regulations such as Rule 66 of the Los Angeles County Air Pollution Control District, and therefore require the installation of highly efficient afterburners. It is noted that the cost of air pollution control are mitigated somewhat because good afterburners reduce condensate formation on oven walls and thus increase production and improve printing quality.

14830

Meyers, R. A., J. L. Lewis, and J. S. Land

PHASE I REPORT. APPLICABILITY OF ORGANIC SOLIDS TO THE DEVELOPMENT OF NEW TECHNIQUES FOR REMOVING OXIDES OF SULFUR FROM FLUE GASES. TRW Inc., Redondo Beach, Calif.; TRW Systems Group, Contract PH22-68-46, Report 10669 6003-R0-00, 52p., Oct. 31, 1968. 19 refs.
CFSTI: PB 185 887

A literature search was conducted to select promising organic solids for removing sulfur dioxide from flue gas, and a preliminary chemical systems analysis for candidate SO2 removal materials was performed. Organic materials were selected on the basis of ability to take up sulfur dioxide, price and availability, thermal stability, regenerability, and mechanical properties. Five organic materials were identified which offered promise for removing sulfur dioxide from flue gas. These were cellulosics, nigrosin, poly(N-vinylcarbazole), pyrolyzed poly(vinylchloride), and pyrolyzed poly(acrylonitrile). The specific cellulosics were waste newsprint, sawdust and cotton. The results of the preliminary chemical systems analysis demonstrate that organic solid sulfur dioxide recovery from flue gases is economically feasible where certain criteria are met. The analysis was keyed to thermal regeneration of the organic solids. However, in the case of cellulosic materials, chemical reaction and conversion of the products to useful commodities may also be a feasible process. As so little is known about the parameters involved in conversion processes at this time, a consideration of this type of regeneration was not included. (Author summary modified)

14850

Trayser, D. A., F. A. Cronwick, J. A. Gieseke, E. E. Hazard, A. E. Keller, and D. W. Locklin

A STUDY OF THE INFLUENCE OF FUEL ATOMIZATION, VAPORIZATION, AND MIXING PROCESSES ON POLLUTANT EMISSIONS FROM ROTOR-VEHICLE POWERPLANTS. Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract CPA 22-69-9, Phase Rept., 185p., April 30, 1969. 120 refs.

A study of automotive engine induction systems was conducted. The objective of this non-experimental program was to explore incentives and approaches for reducing exhaust emissions by extending the lean-mixture operating limit through improved induction-system performance. The study was divided into four major subtasks: development of mathematical descriptions of induction-system phenomena; evaluation of methods for measuring mixture characteristics; conception of approaches to the definition and measurement of mixture quality; and evaluation of alternative atomization methods. The results of this study indicated that extension of the present limits, made possible by improved air-fuel distribution, can lead to modest but worthwhile reductions in emissions of both unburned hydrocarbons and carbon monoxide and to substantial reductions in the emission of nitrogen oxides. Minimizing or eliminating the liquid-fuel film on the intake manifold walls was concluded to be the most promising approach to achieving improved distribution. The liquid film can be reduced by employing atomizing devices that will produce droplet sizes approaching 10 to 20 microns under all operating conditions, by designing the induction system for minimum impaction of fuel droplets, and by heating the manifold walls to vaporize the fuel that is avoidably impacted. Recommendations included an experimental program comprising the design, fabrication, and evaluation of an induction system with a carburetor employing an alternative, improved atomization device and a low-impaction intake manifold.

18544

Fukuchi, Tomoyuki and Takeo Yamamoto

A FEW IDEA ON COUNTERMEASURE AS TO BE CONNECTION WITH EXHAUST GAS FROM GAS-WORKS AND DAMAGE ON MANDARIN. (Toshigaso seisankojo no haigasu to mikan no higai narabini sono taisaku ni kansuru shoiosatsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(9):17-23, Sept. 1969. 22 refs.

Because mandarin oranges fall from trees before the harvest period, waste gas from a gas works near the orange orchard was suspected to be the cause. With this idea as a starting point, the relationship between waste gas and ripening oranges was examined in a laboratory. The possibility that the ripening period had been accelerated by other factors, such as hydrocarbon gases, especially ethylene, was considered. It was reported by Nagil that the tomato is influenced by hydrocarbons such as ethylene, 0.1 ppm; acetylene, 50 ppm; propylene, 50 ppm; and butylene, 50,000 ppm. Thus, a very small amount of ethylene has a great influence on ripening fruit. According to the result analysis of the waste gas, the assumption that windblown ethylene influenced the ripening orange is reasonable. The boiler system for waste gas control is shown. By means of chemical reactions, ethylene vanished at 250 C. Gas compounds are first prevented from entering the boiler and are then sent to a reservoir tank and mixed with catalyst and steam, and finally discharged in vapor form. By this treatment, the waste gas compounds are vaporized. Since this boiler system has been used at the gas works, damage to oranges has decreased.

14967

Hoke, O. R. and R. B. Engdahl

A STUDY OF EFFLUENTS FROM DOMESTIC GAS-FIRED INCINERATORS. American Gas Association, Inc., New York, Proj. DG-38, 27p., June 1959. 24 refs.

Measurements were made of the effluents from nine domestic gas-fired incinerators, including two new prototype models, five new commercial units, and two older units. Standard test charges that typified wet domestic wastes and dry combustible materials, and two special refuse mixtures were burned. A free-standing chimney provided natural draft for the units. Sampling and analytical techniques were based on recognized methods. The concentrations in ppm in the flue gas and the emission rates in pounds per ton of refuse burned were determined for aldehydes, nitrogen oxides, organic acids, ammonia, and hydrocarbons. Grain loadings and emission rates were determined for particulate matter which included tarry organic materials. Odor and smoke density were also determined. Results demonstrated that significant reduction in emissions has been achieved through recent improvements in incinerator design. When wet domestic wastes are incinerated in new units, of up to 6-fold decreases in the rate of aldehyde emissions are achieved. Decrease in organic acids is 3-fold; decrease in saturated hydrocarbons is 8-fold. Although nitrogen oxides have increased 3-fold because of increased gas in the afterburner, their concentration is still lower compared to other combustion sources. Smoke, odor, and particulate matter emissions decreased to acceptable levels. Comparison of these emission rates with those from municipal incinerators shows that the new improved gas-fired domestic incinerators have lower particulate emissions, and, in general, equally low emissions of gaseous pollutants. Emissions from improved gas-fired units were in most cases lower than those from other incinerators and large gas- and oil-fired industrial heating units; they were much lower than those from automobile exhaust. The results of the study provide a basis for modification of the present restrictions in certain areas on the use of gas-fired domestic incinerators and for confirmation of their present acceptance in other areas.

14975

Lee, R. T. and D. D. Dingee

EXHAUST EMISSION ABATEMENT BY FUEL VARIATIONS TO PRODUCE LEAN COMBUSTION. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1960. 15 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1960, Paper 600769.)

Differences in the power producing capacities and exhaust emission characteristics of various spark-ignition-engine fuels are frequently obscured by interactions involving the particular engine system used in the comparison. In an attempt to minimize this problem, gasoline, propane, methane, and a hydrogen-methane fuel gas were compared in a single cylinder engine under conditions that were optimum for each fuel. The resulting data, coupled with an estimated duty cycle

representative of traffic service, permitted the development of internally comparable data on fuel consumption and exhaust emissions. Smog-inducing hydrocarbon emissions from the exhaust of a propane-fueled engine can be less than 13% of the minimum value obtainable with a gasoline fueled engine. Such emissions would be substantially eliminated with a well designed methane engine. Engines designed for propane and methane should have substantially no carbon monoxide in the exhaust, and only 40-50% as much nitric oxide as an engine designed for gasoline. In addition, lower specific fuel consumptions are possible with propane and methane. These benefits are primarily the result of better lean combustion performance with the two gaseous fuels. It is recognized that a fuel gas that might be steam-reformed from a liquid fuel would have even better lean mixture combustion behaviour and lower emissions than propane or methane. (Author abstract modified)

15257

Groesinger, H.

IMPROVEMENTS IN EXHAUST GAS COMPOSITION OF CARBURETOR ENGINES. (Abgasentgiftung bei Vergasermotoren). Text in German. Motortech. Z. (Stuttgart), 29(9):355-365, 1968. 14 refs.

Recently developed measures for reducing automotive emissions are reviewed. The carburetor, the ignition system, the shape of the combustion chamber, stroke vs bore ratio, design of the intake pipe, and the cooling system are responsible for the amount of emissions. The amount of CO and hydrocarbon emissions can be reduced (1) by oxidizing the CO and the unburnt hydrocarbons in the exhaust system through air injection (afterburning) and (2) by limiting the emissions from the cylinders. Optimum reduction of emissions through afterburning depends on an adequate air injection, a carefully adjusted fuel-to-air ratio, and on a proper timing of ignition. Measures involving the carburetor include a limiting device for maximum and minimum fuel-to-air ratio at idling engine, a device for thorough fuel mixing at idling and partially loaded engine, adjustment of the fuel/air ratio at idling engine to the different frictional forces of new and used engines, closer tolerance of the bypasses, exact adjustment of the temperature of the fuel/air mixture to the temperature of the engine, etc. Transport of the fuel/air mixture to the cylinders and uniform distribution are of great importance for emission control. Several illustrations of the distribution of the fuel/air mixture by various types of carburetors are given. Improvements through modification of the carburetor are indicated in graphs. In California, hydrocarbon emissions by automobiles have been limited to 275 ppm, CO emission to 1.5%. In 1969, the Federal Republic of Germany will limit CO concentrations at idling engine to 4.5%.

15271

Andersen, Holger C.

CLEANING OF INDUSTRIAL GASES WITH PRECIOUS METAL CATALYSTS. (Industrielle Gasreinigung mit Edelmetallkatalysatoren). Text in German. Dechema Monograph., 60(1016-1041):325-33, 1968. 20 refs.

The applications of platinum metals as catalysts for removing acetylene from olefins, cleaning coke-oven gas, and treating residual gases from the nitric acid production are reviewed. Of the family, platinum palladium is particularly suited for the hydration of acetylene so that only a few ppm remain. Recent laboratory tests indicate that at gas throughputs of up to 4500 standard cu m/hr/cu m catalyst, the addition of hydrogen can be reduced to a mole ratio between hydrogen and acetylene of 2. In the case of coke-oven gases, acetylene, nitrogen oxides, carbon oxysulfide, and diolefins are converted into harmless, easily removable compounds by palladium and ruthenium catalysts. Catalytic treatment of residual gases from nitric acid production has three goals: the removal of noxious components, recovery of the nitrogen in pure form for re-use at the ammonia synthesis, and production of heat. Recent laboratory tests show that the process can reduce the nitric oxide content of waste gases to 9 ppm.

15321

Eberan-Eberhorst, H.

FORWARD-LOOKING EXHAUST GAS RESEARCH FOR THE AUTOMOTIVE PETROL ENGINE. (Abgasforschung zukunftsweisend fuer den Fahrzeug-Otto-motor). Text in German. Motortech. Z. (Stuttgart), 30(9):315-323, Sept. 1969. 18 refs.

The influence of engine operation modification on the emission of such exhaust gas components as CO, hydrocarbons and nitrogen oxides is discussed. The use of an evaporator helps reduce carbon monoxide emissions to the lowest possible concentration. A spinning motion in the air intake pipe also reduces the CO content. The type of carburetion has almost no effect on the CO or hydrocarbon emission. Study of the influence of temperature cooling agent on hydrocarbon emission showed that emission could be considerably reduced by raising the temperature of the agent. When the engine acts as a brake, hydrocarbon emissions jump to high concentrations due to misfiring. Spiral-like intake pipes or vortex-imparting installations in the intake system, tangential inlets or deflector valves have a considerable influence on hydrocarbon emission, which is decreased because the wall layer is completely burned due to the higher turbulence. This however, costs power. Compression of the intake air and spark timing also reduce these emissions. With a commonly used idling mixture containing 3% CO, the hydrocarbon emissions of a 1-liter four cylinder engine were reduced from 1720 ppm at 30 degree ignition advance to 180 ppm at 10 degree ignition delay. The emission of nitrogen oxides can be reduced by exhaust gas return to the fresh air which reduces the caloric value of the fuel/air mixture and by water injection into the intake pipe. Tests with the latter method showed that nitrogen oxide emissions could be reduced from 2000 ppm to 581 ppm. At loads equal to one, a 20% addition of exhaust gas has the same effect as water injection at a water to fuel ratio of 1:2.

14827

Bothe, Wilfried, Karl Achenbach, and Guenther Bretschneider

NEW PROCESS FOR DESULFURIZATION OF HYDROCARBONS AND TECHNICAL GASES. (Ein neues Verfahren zur Entschwefeln von

Kohlenwasserstoffen und technischen Gasen). Text in German. Erdoel Kohle (Hamburg), 17(5):352-356, May 1964. 17 refs.

A newly developed process for desulfurization of aliphatic, naphthenic, and aromatic hydrocarbons with sodium oxide or sodium hydride is described. Gaseous hydrocarbons are passed over sodium oxide tablets or granules; the best results were achieved with a 1:1 mixture of Na2O and NaCl. The reaction of the sulfur compounds with Na2O follows the equation 2Na2O + RSR yields Na2S + 2NaOR, where R equals an organic radical or H. At the prevailing temperature, NaOR dissociates again with separation of carbon. A theoretical quantity of 124 g Na2O is necessary for binding 32 g of sulfur; otherwise 200 kg of the Na2O-NaCl desulfurizing mixture can bind 25.8 kg sulfur. In experiments with a scaled-down model, 9 to 10 kg S (more than 70% of the theoretical value) were bound per 100 kg desulfurizing mass. In the laboratory, gasolines with various boiling points were evaporated at temperatures from 150 to 200 C and passed over the Na2O-NaCl mass which was heated to 220 C. The results showed that 95 to 99% of the total sulfur could be removed. The successful laboratory results encouraged experiments with a 0.5 ton/day model. Light gasolines with sulfur content of less than 6 ppm and benzenes with sulfur content of less than 5 ppm were used. The theoretical absorption capacity could not be reached, owing to traces of moisture and organic nitrogen and oxygen compounds. The process can also be used for cleaning technical gases such as nitrogen and hydrogen.

15349

Luoiaro, Pentti

THE TECHNICAL PRINCIPLE OF OPERATION OF EXHAUST GAS PURIFIERS. (Pakokaasunpuhdistimien tekniikan toimintaperi). Text in Finnish. Tekniikan Aikakausiehti, no. 4:71-73, April 1969.

The main principle of exhaust purification for internal combustion engines is as complete a combustion as possible. About 20-30% of the hydrocarbons reaching the tailpipe are derived from crankcase ventilation. The air injection reactor (AIR) system used by three large U. S. automobile manufacturers offers no advantages in terms of fuel consumption and slightly decreases the hot capacity of the motor. The controlled combustion system (CCS) used by General Motors preheats the air arriving at the cylinder intake while the motor is warming up or during idling or low-speed operation. Volvo passenger cars make use of twin carburetors in conjunction with CCS, which offers the advantage of a slight fuel economy. The Chrysler Motors cleaner air package (CAP) makes use of a special vacuum valve used in conjunction with new types of carburetor, distributor, and gear box. This valve interprets motor speed and load in such a way as to control the timing of ignition in the distribution. Use of transistorized ignition systems has been abandoned as impractical, but thyristorized ignition has been successfully tested on numerous vehicles. Since the lifetime of motor vehicles in Finland is about 9 years, there are many American vehicles lacking exhaust purification, whereas Volvo cars always have had exhaust purifiers as standard equipment. Exhaust purification laws would thus tend to favor Scandinavian industry. The argument that domestic manufacturing

of autos would help combat pollution makes absurd when Finnish manufacturers are constantly marketing motorized appliances that foster pollution and have been banned in Sweden for this reason.

19618

HOT GAS ENGINE REVIVAL. Design Components Eng., no. 2:10-13, Jan. 15, 1969.

A description of the hot gas engine used to decrease air pollution by diesel fumes is presented as developed by the Philips Research Laboratories at Eindhoven in Holland. All hot gas engines depend on compressing a gas at high temperature and expanding it to a low temperature, allowing the gas to do work on a piston. Heat is conserved within the engine by incorporating a heat exchanger between the permanently hot chamber and the permanently cold chamber. The regenerator receives heat from the media during expansion and returns it to the media during recompression, when the gas is again pushed back into the hot chamber. Most of the multi-cylinder engines are based on work carried out on single-cylinder units. The invention of the rhombic drive enabled the use of the out-of-phase layout and obviated the need for the pressurized crankcase. It consists of a geometric shape enclosed by the piston rod yoke and displacer rod yoke, and their associated connecting rods at any position during the engine cycle. The working gas is maintained at high pressure by an ancillary pump which serves to vary the mean effective pressure within the cylinder and the power developed by the engine. A cylinder burner air preheater shrouds the nest of heater tubes during engine operation. The 'roll-sock' seal is used to seal the piston rod and prevent oil fros entering the cylinder fros the crankcase. Analyses carried out on the burner exhaust gases revealed the following: 1-2 ppm of unburnt hydrocarbons, 0.007-0.030% carbon monoxide, and 100-200 ppm nitrogen oxides.

19651

AUTOMATED LINE FOR THE PRODUCTION OF EXTRUDED AIR ROTORS. Mach. Prod. Eng., 113(2917):748-752, Oct. 9, 1968.

The General Motors air injector reactor, used with high-performance automobile engines and in cars equipped with manual transmissions, controls the exhaust emission of hydrocarbons and carbon monoxide. Fresh air is injected into the engine exhaust ports to produce a higher degree of afterburning and to ensure that the final exhaust gas composition is acceptable. Supplementary air is supplied by pumps. Possible methods were studied for mass production of the air pumps at the rate of 13,000 per day. Raw material and machining requirements were reduced and stronger parts obtained when the air pump rotors were cold extruded: the slug is sheared from a bar, coined, extruded, and reworked. Slug shearing is carried out on a Verson 250-ton press operating at 60 strokes per minute. Sheared slugs are rolled down a discharge chute to a conveyor which delivers them to an automatic weighing and segregating unit. Acceptable slugs drop into one chute; overweight and underweight slugs slide down separate chutes. Upsetting of the sheared slugs is performed on a Bliss 800-ton knuckle-joint press. Upset slugs are washed

and receive a normalizing annealing treatment to produce a uniform structure and a hardness of 45 to 50 Rockwell B. Prior to extrusion, the slugs are cleaned, phosphate coated, and lubricated. Extrusion of the rotors is carried out on a Clearing 1500-ton, eccentric, gear-driven mechanical press. Final forming of the closed bottoms of the rotors is carried out by a restrike operation performed on a Bliss 1500-ton knuckle joint press. Piercing of slots in the rotors and formation of notches to serve as chipbreakers during subsequent machining are performed on a Denly 100-ton press. External surfaces are finished on Landis plunge grinding machines; bores are finished on Bryant Centalign internal grinding machines. Air sealing between the high and low pressure areas of the pumps is provided by spraying exterior surfaces of the rotors with an abradable coating.

19511

Jackson, Marvin W.

EXHAUST HYDROCARBON AND NITROGEN OXIDE CONCENTRATIONS WITH AN ETHYL ALCOHOL-GASOLINE FUEL. Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1964. 29 refs. (Presented at Society of Automotive Engineers Summer Meeting, Chicago, June 8-12, 1964.)

The exhaust hydrocarbon and nitrogen oxide concentrations of a single-cylinder engine operating on a 25% vt ethyl alcohol-75% gasoline fuel are compared to those of the same engine operating on gasoline. Comparisons at an air-fuel ratio below 15.3 indicate that adding ethyl alcohol to gasoline reduces exhaust hydrocarbon concentrations but increases nitrogen oxide concentrations. At an air-fuel ratio higher than 15.3 ethyl alcohol reduces both hydrocarbon and nitrogen oxide concentrations. However, tests at the same air-fuel ratio indicate that ethyl alcohol increases surge and, in some cases, results in a power loss. To overcome these performance problems, the ethyl alcohol-gasoline fuel must be operated at about the same percent theoretical air as gasoline and comparative tests at the same percent theoretical air show that the additive has little effect on exhaust hydrocarbon and nitrogen oxide concentrations. The fuel mixture offers no promise for reducing pollution by automobiles. (Author abstract modified)

19528

Mitch, W. F.; H. G. Rose; and H. F. McDuffie

TESTS OF VARIOUS PARTICLE FILTERS FOR REMOVAL OF OIL MISTS AND HYDROCARBON VAPOR. Oak Ridge National Lab., Tenn., ORNL-TM-1621, 26p., Sept. 7, 1966.
CFSTI: TM 1621

Various filter and adsorbent materials were examined for possible use in removing oil mists and hydrocarbon vapors. A controlled flow of oil was injected into a heated nickel reaction vessel to cause vaporization and some cracking of the oil. Helium flowing through the reaction vessel carried the oil mist and hydrocarbon vapor through a filter system. Filter effectiveness was determined by the use of a hydrocarbon

detector, gravimetric analysis, and gas chromatographic analysis. Good removal of mists was achieved by the use of a combination of felted metal fibers, and ceramic fibers in a configuration proposed for use in the molten salt reactor experiment. Granulated charcoal removed hydrocarbon vapors (C6 and above) in a manner consistent with the established adsorption isotherms for this material. (Author abstract modified)

15618

Olesov, N. A.

EFFECT OF NAPHTHENIC SOAP ON THE PROPERTIES OF INDUSTRIAL DUST. (Deystviye naftenatov na svoystva tekhnologicheskoy pyli). Text in Russian. Tashkent, no. 9:14-15, 1969. 3 refs.

Pilot-plant studies revealed that the introduction of naphthenic soap into furnace flue gas increases the fluidity of the dust by approximately 20% and reduces R2O (R is an unspecified radical) and SO3 content of the dust by a factor of about two. The specific resistivity of a layer of collected dust remained within the same limits as dust without the additive (1000 to 10,000 megohm-cm) thus maintaining electrostatic precipitator effectiveness. Addition of naphthenic soap to dry ground raw material such as cement increased the mobility of the raw material powder by 6-7% and its volumetric weight by 5-7%. In addition, the load on the main grinder drive was reduced by 5%, improving grinder operation and reducing power consumption. The experiment lasted for 70 hrs, during which time 3.93 tons of dry naphthenic soap were introduced.

15765

Newman, Daniel J.

ELIMINATION OF NITROGEN OXIDES FROM GAS STREAMS. (Chemical Construction Corp., New York) U. S. Pat. 3,467,492, 4p., Sept. 16, 1969. 2 refs. (Appl. Nov. 6, 1964, 15 claims).

Conventional processes for eliminating nitrogen oxides from waste gas streams, such as tail gases from nitric oxide production, involve reacting methane with waste gases in one catalytic step, after which the waste gas is passed through a waste heat boiler and/or a gas turbine; or in two catalytic beds with intermediate cooling. The former method presents difficulties in design and operation; the second requires an intermediate exchanger or boiler, as well as ancillary control devices. In the present invention, nitrogen oxides are eliminated by a sequence involving two or more catalyst beds. The waste gas stream is divided into at least two portions; one portion is heated to 900 F and mixed with a proportion of methane less than the stoichiometric requirement for complete reaction with the oxygen and nitrogen oxides contained in the first portion. The gas mixture is then passed through the first bed where the stream temperature is raised to 1000-1400 F. Because the reaction with methane is not complete, the catalyst bed is not subjected to overheating and deterioration. The reacted gas mixture from the first bed is then quench-cooled to 900 F by the addition of a second portion of

methane and cold waste gas. If only two beds are used, sufficient methane is added between beds to react with all the nitrogen oxides, and a final reacted stream free of nitrogen oxides is produced from the second bed. Advantages of the process are the substantial savings resulting from the elimination of the intermediate exchanger and reduction of the size of the heater required to preheat gases. In addition, improved operation is provided because the valves controlling the flow of waste gas and intermediate mixtures can be operated at low temperature.

15778

Okuno, Yoshiko

THE REACTION BAD ODOR SUBSTANCES WITH OZONE. (Akushu seibun to ozon no hannosei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(8):631-639, Aug. 15, 1969. 8 refs.

The removal of industrial odors by the use of ozone oxidation was studied, and their properties and behavior were described with the introduction of electron theory. Malodorous components are amine-ammoniacal compounds, lower aliphatic acidic compounds, sulfurous compounds, olefin-paraffin hydrocarbons, and other organic compounds. Olefinic hydrocarbons have a characteristic odor and a reaction mechanism for olefinic hydrocarbons and ozone was described. One of the most general reactions of the carbon-carbon double bond is an addition of ozone and rearrangement of the resultant ozonide whereby the ozonide is directly hydrolyzed by boiling with water. Secondary and tertiary amines were employed to examine reactivity and reaction products. Reactivity was determined by measuring residual ozone quantity, and reaction products were monitored by gas-chromatography. Tertiary amines reacted extensively with ozone and formed various compounds. Acrylic ester monomer, used as a raw material of acrylic acid resin, is very odorous. An oxidation experiment using acrylic ester and methacrylate was done for the removal of this odor. Acrylic ester reacted faster than methacrylate. A reaction of acrylic ester with ozone proceeded relatively fast, so this odor can most readily be removed by selecting appropriate reaction conditions. In conclusion, not all odorous components can be removed by ozone oxidation, due to the difficulty in reducing 1 ppm of malodorous components to 1 ppb (99.9% removal case). Optimum reaction conditions and apparatus must be found for the use of ozone reaction methods on odorous sources.

15779

Process of purifying gases, especially synthesis- and fuel-gases. (Gesellschaft fuer Linde's Eismaschinen A. G., Abteilung Gasreinigung und Luftzerlegung, Gesellschaft fuer Wasserstoffbolt m. b. H.) British Pat. 697,604. 11p., June 17, 1953. (Appl. Sept. 13, 1950, 16 claims).

A process for purifying gases derived from synthesis, cracking, hydrogenation, and other chemical processes was invented. Undesirable components of the gases, particularly hydrogen sulfide, organic sulfur compounds, carbon dioxide, easily-boiling compounds, and low boiling hydrocarbons, are removed simultaneously in a washing and cooling process. The washing operation is done

at 0 C or lower and 2 atm pressure with a polar washing agent. The washing operation can be carried out in a series of stages with the same or different washing agent. The freezing point of the washing liquid must be lower than the washing temperature. The liquid is usually composed of oxygen-containing compounds such as low molecular weight aldehyde, ethers, esters, ketones, and organic acids or nitrogen-containing compounds such as ammonia, amines, and pyridine bases. Complex-forming metal salts may be added to the washing agent to increase the solubility of all the components to be washed out. The regeneration of the washing agent is done in stages to remove the substances separately in a concentrated form.

19836

Hooker, George W., Lewis B. Drake, and Stephen C. Stowe

SULFUROUS DIOXIDE RECOVERY METHOD. (Sun Chemical Co., Midland, Mich.) U. S. Pat. 2,388,546. 4p., Jan. 30, 1945. (Appl. Aug. 18, 1939, 11 claims).

A method for recovering substantially pure sulfur dioxide from mixtures with other gases or low boiling hydrocarbons involves the absorption of sulfur dioxide in liquified dialkyl sulfones, preferably butadiene sulfone and isoprene sulfone. Equimolar mixtures of these or other cyclic sulfones, obtained by boiling or by addition of a solvent, have great absorptive capacities for sulfur dioxide. Gaseous mixtures can be treated in scrubbing towers or other equipment suitable for extractants. Sulfur dioxide is evaporated from mixtures by warming the sulfone solution between 70-100 C, the temperature range below that at which sulfone decomposes. The vaporized sulfur dioxide is collected in the usual manner and the extractant is recovered for further use. Other components in the sulfur dioxide mixture are relatively unaffected by the sulfone treatment. The ratio of the recovered sulfur dioxide is four times that of sulfur dioxide recovered by using water as an extractant. In addition, sulfone treatment, unlike water treatment, does not involve the formation of a corrosive acid solution. Suggested applications of the method include the treatment of sulfur dioxide-nitrogen-oxygen mixtures produced by sulfur oxidation processes and hydrocarbon mixtures produced by petroleum processes.

19837

Hubbard, George D.

RECOVERY OF SULPHUR DIOXIDE AND OLEFINES FROM SULFONES. (Sun Chemical Co., Midland, Mich.) U. S. Pat. 2,384,376. 7p., Sept. 4, 1945 (Appl. Nov. 3, 1941, 9 claims).

When liquified sulfur dioxide is used to separate olefins such as butadiene from cracked-oil gas or mixtures of the gas and hydrocarbons, a sulfone is formed and then chemically decomposed to form a gaseous mixture of sulfur dioxide and olefin. Separation of the sulfur dioxide from the mixture by scrubbing with water is unsatisfactory because of the heat required for vaporization and the corrosive nature of the resulting sulfuric acid. An improved method for recovering sulfur dioxide from a sulfone thermally decomposes the sulfone, at pressures sufficient

to liquefy the mixture, in the presence of a liquid paraffin hydrocarbon of boiling point higher than the diolefin. The solvent also effectively separates the reaction products to inhibit or prevent recombination into the sulfone. Suitable solvents are hexane, octane, or decane and liquid petroleum fractions such as gasoline, naptha, or kerosene. The sulfone-solvent mixture is passed through the heating zone of a 'sulfone decomposer' and heated to 120-150 C. Here the sulfone is partially decomposed into sulfur dioxide and the diolefin. The resulting liquified mixture is then cooled below 120 C and, while maintained under pressure, passed to an extraction tower. Additional quantities of liquified sulfone are passed through the tower in counter-current flow. The resulting solution of sulfur dioxide and sulfone is continuously withdrawn from the bottom of the tower; the solution of diolefin and liquid paraffin hydrocarbon is continuously withdrawn from the bottom of the tower. The reaction products of the solution are vaporized and collected in a form of 95% or higher purity. The solvent is cooled and returned to the tower for recycling.

15681

Johnson, Ava J.

PROCESS FOR THE SEPARATION OF ACIDIC GASES FROM FLUIDS. (Shell Development Co., San Francisco, Calif.). U. S. Pat. 2,366,595. 4p.; Jan. 30, 1945. (Appl. Aug. 29, 1941, 7 claims).

The invention describes process for removing acidic gases, such as H_2S, CO_2, HCN, SO_2, found in natural gas, petroleum fractions, and coke oven gas from a water immiscible fluid. It deals especially with the purification of normally gaseous hydrocarbons containing objectionable quantities of H_2S. The method consists of scrubbing the fluid at an elevated pressure of 300-1000 pounds per square in. with a nonalkaline water. A portion of the acid gas is extracted by the nonalkaline water to form saturated water and a first treated fluid. The saturated water is separated from the first treated fluid. The residual fluid is then scrubbed with a lean base solution chosen from organic hydroxy amine bases or salts of inorganic strong bases and relatively weak acids of low volatility. Another portion of the acid gas is extracted to form a fat solution and a second treated fluid. The fat solution is separated from the fluid and refluxed with steam at a lower pressure to produce a vapor composed of acid gas, steam and a residual lean base solution for use in another scrubbing cycle. The saturated water is stripped with steam vapor to vaporize the acid gas and condense water substantially free of the acid gas. The invention accomplishes a high degree of purification of fluid with a minimum expenditure of heat for regeneration of the absorption medium.

15682

Rosenstein, Ludwig

GAS PURIFICATION AND SEPARATION PROCESS. (Shell Development Co., San Francisco, Calif.). U. S. Pat. 2,366,606. 6p., Jan. 30, 1945. (Appl. Jan 24, 1942, 8 claims).

The invention increases the efficiency of processes for removing H_2S, HCN, CO_2, etc., from hydrocarbon liquids by reducing the

amount of heat required for regeneration or by removing more impurity from a spent solution with a given amount of heat. The fluid is contacted in a scrubber with a heat-regenerable absorbent solution to form a fat, or spent, solution which contains the impurities. The absorbent solution i.e., aqueous Na_2CO_3 or aqueous K_3PO_4, contains a solute which removes the impurities and a solvent which vaporizes above the boiling point of the impurities. The fluid is separated from the fat solution which is regenerated at reduced pressures for further scrubbing. The improvement in the invention comprises the regeneration of the fat solution in a primary stripper to produce a lean solution and vapors. The vapor is composed of gases from the solvent and impurities. A further portion of the lean solution is regenerated in a secondary stripper in indirect heat exchange with the vapors at a greater pressure than in the primary stripper. A secondary lean solution and secondary vapors are produced which also contain gases from the solvent and impurities. The vapors from both strippers are cooled to produce a condensed solvent and vapor containing the impurities. The solvent is separated from the vapor and added to the secondary lean solution. The lean solutions are put into the scrubber in a way that the fluid first contacts the primary and then the secondary lean solution. Fluids that can be scrubbed by the process include natural gas, refinery gas, coke-oven gas, water gas, other manufactured gases as well as liquid hydrocarbons.

15875

Hooker, George W. and Franc A. Landon

SEPARATION OF SULFUR DIOXIDE AND LOW-BOILING HYDROCARBONS FROM MIXTURES THEREOF. (Sun Chemical Co., Midland, Mich.) U. S. Pat. 2,384,378. 8p., Sept. 4, 1945. (Appl. Nov. 3, 1941, 4 claims).

The invention concerns the separation of mixtures of sulfur dioxide and aliphatic hydrocarbons, and particularly the separation of sulfur dioxide and conjugated diolefines to recover each in an anhydrous and purified form. Separation is achieved with two constituents, a liquified organic sulfone and a liquid paraffin hydrocarbon having a boiling point of at least 20° C. Sulfur dioxide is preferably separated from a conjugated diolefine having 5 or less carbon atoms by passing it into the mid-section of an extraction tower. At the same time, a liquid fraction of petroleum is passed into the bottom of the tower, a liquified sulfone of the conjugated diolefine is passed into the tower at the top and dispersed. The flow of liquids in the tower is under a superatmospheric pressure so that remain in liquid form. During the separation process, the resultant extract of liquid petroleum and conjugated diolefine is withdrawn from the top of the tower. The extract of liquified sulfone and sulfur dioxide is withdrawn from the bottom of the tower, the sulfur dioxide vaporized to leave the sulfone in condition for recycling.

15895

Gotoh, Takeshi, Kazuhiko Takeichi, Masakuni Hirata, and Hanzaki Hattori

THE POSSIBILITY OF AUTOMOBILE AIR POLLUTION CONTROL BY LOW PRESSURE PETROL INJECTION SYSTEM. (Teiatsu gasuriu funsha houhibi ni yoru haiki haison no hasseki). Text in Japanese. Waseda Daigaku Rikogaku Kenkyusho Hokoku (Bull. Sci. Eng. Res. Lab., Waseda Univ.), no. 40:59-67, 1969.

The fact that automobile emissions can be controlled by petrol injection is well known. The possibility that manifold gasoline injection at a pressure less than 10 atg can reduce carbon monoxide and hydrocarbon contents in engine exhausts was investigated. Injection systems with one, two, three, and four element pumps and nozzles were used which corresponded to the four cylinder engine. Carbon monoxide and hydrocarbon concentrations were measured in various engine loads and speeds and compared with the carburetor system. The results showed that systems with only one or two elements could reduce carbon monoxide concentrations, but not the hydrocarbon content. Three or four elements in the system were required to reduce both carbon monoxide and hydrocarbon emissions, but this was less than the expected value. (Author abstract modified)

15941

Yee, Philip H.

CONSIDERATIONS OF THE FEASIBILITY OF CONTROL OF OXIDES OF NITROGEN. J. Air Pollution Control Assoc., vol. 7:234-240, Nov. 1957. 28 refs.

A review of existing theories of the role of nitrogen oxides and hydrocarbons in ozone and smog formation is followed by a consideration of the nature and contribution of various sources of nitrogen oxides in Los Angeles County and an evaluation of methods for controlling the oxides. In Los Angeles, nitrogen oxide emissions are primarily the result of nitrogen fixation in combustion processes, according to the equilibrium N2 plus O2 equals 2NO. Variables in combustion processes are temperature, excess air, and in the case of automobiles, engine acceleration rate. Theoretical and experimental data show that there is no ready solution for the control of nitrogen oxides as a general atmospheric contaminant. Much experimental work needs to be done before satisfactory devices are developed. The importance of research on the catalytic decomposition of nitric oxide is stressed. It is also suggested that methods of accelerating vapor phase reactions of NO may have applications for controlling nitrogen oxide emissions from stationary sources. Other possible methods of control discussed are absorption, adsorption, and changes in the design of combustion equipment or its operation or changes in fuel.

15965

Jaeger, Paul

METHOD OF SEPARATING SULPHUR DIOXIDE AND THE LIKE FROM LIQUID HYDROCARBONS. (Edelgas Gmbh; Duplo, German) U.S. Pat. 1,910,341. 4p., May 23, 1933. (Appl. Jan. 17, 1930, 6 claims).

A process for evaporating and recovering sulfur dioxide from mixtures of liquid hydrocarbons and SO2 is reported. A mixture

is forced under sustained pressure through a series of alternate heating and separating containers. Sulfur dioxide gas is allowed to evolve in each heating container and is separated from the liquid in the following separating container. The remaining liquid is raised to a higher temperature in the next heating container. The gas is liquified as it evolves. This is cooled in another container while still under sustained pressure. The process has an important application for the refining of mineral oils, increasing the capacity of the refining plant and decreasing the cost of treatment.

15905

Herold, Paul and Georg Markus

RECOVERING HYDROGEN CHLORIDE AND SULFUR DIOXIDE FROM GAS MIXTURES. (Assignee not given.) U. S. Pat. 2,301,779. 3p., Nov. 10, 1942. (Appl. Nov. 10, 1940, 3 claims).

A method of recovering hydrogen chloride and sulfur dioxide separately from gas mixtures is described. A gas mixture is washed with a washing liquid which consists of aromatic compounds containing oxygen in an ethereal linkage and of aromatic compounds containing oxygen in a phenolic linkage. Suitable compounds are xylenol and diphenyl ether. The gas mixture may either be passed through the liquid while it is stationary or led in a counter-current to the liquid flowing down, preferably in trickling towers charged with filler bodies. The hydrogen chloride leaves the washing liquid in a dry state free of sulfur dioxide. The washing liquid is easily regenerated by expelling the absorbed sulfur dioxide by heating, applying reduced pressure, or by subjecting it to both measures simultaneously. The washing liquid can be reused after cooling.

15999

Battram, Robert Roger

PROCESS FOR SEPARATING ACIDIC GASES. (Stratford Corp., Louisville, Ky.) U. S. Pat. 1,834,016. 6p., Dec. 1, 1931. (Appl. Oct. 15, 1930, 9 claims).

A process for the separation of acidic gases from other gases by the use of an absorbent is described. A gas mixture containing hydrogen sulfide, carbon dioxide, or sulfur dioxide, is brought into contact with a liquid or gelatin absorbent. The absorbent is usually a phenylhydrazine of a hydrazine hydrazide. The solution is heated to free the absorbed gases and the absorbent can be recycled.

16020

Clarke, F. A., A. B. Garrard, C. E. Sharretson, A. Vardi, and H. V. Wade

AN ADSORPTION-REGENERATION APPROACH TO THE PROBLEM OF EVAPORATIVE CONTROL. Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1967. 5 refs. (Presented at the Automotive

Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670128.)

A device for preventing evaporative emissions of hydrocarbon fuel from automotive vehicles is based on a controlled adsorption-desorption cycling in a solid adsorbent system using activated carbon. The system is capable of containing all types of evaporative emissions: carburetor and tank running losses, carburetor hot soak losses, and tank diurnal cycle losses. The three essential components of the system are the canister of adsorbent, the pressure balance valve, and the purge control valve. The canister traps the vapors before they can escape to the atmosphere and holds them until they can be fed back to the engine. The pressure balance valve maintains metering forces in the carburetor exactly as originally designed. When the engine is shut down, the valve closes all external vents and routes vapors from the carburetor exactly as originally designed. When the engine is shut down, the valve closes all external vents and routes vapors from the carburetor bowl to the canister. The function of the purge control is program stripping of the canister and consequent feeding of the hydrocarbon-laden, purge air stream to the intake manifold. Evaporative emissions from cars on which prototype devices were installed were measured according to proposed California standards for carburetor losses per hot soak and for fuel tanks. All data fell within a range of 0.1 to 105 grams, well below the proposed gram losses.

16139

Green, Edward

DRIVING WITH METHANE. Sci. News, 97(3):73-74, Jan. 17, 1970.

A dual-fuel system was developed which gives cars, trucks, and buses the option of operating on gasoline or on the compressed natural gas, methane. Converting the system to a single methane and the cost of an entire system is $350 (1970). The few moving parts in the system and its adaptability permits its continual use. There are only three main functional parts in the system: the cylinders of compressed methane, the regulator, and the gas-air mixer. The pressure cylinders, which range from 50-lb units containing 100 cu ft of gas to 300-lb cylinders containing 500 cu ft, can be put in or under the flatbed of a pickup truck, in the trunk of a car, or under it, or on a bus or truck. The function of the regulator is to reduce the pressure of the gas coming from the highly pressurized cylinder so that it can feed into the gas-air mixer mounted on top of the carburetor. The mixer, the heart of the system, is the equivalent of a carburetor and air filter and replaces the ordinary air filter that sits on top of the engine. Because of the limited mileage (two 300-lb cylinders constitute the extreme), the system is not meant to be operated on natural gas on the open road where gas stations are but a problem. It is mainly designed for stop-and-go city traffic. Advantages include quiet starting in cold weather, no vapor lock in hot weather, and low maintenance since because of cleaner fuel. In addition, there is no coating of gasoline from the fuel and no water problem because the mineral gas is lighter than air and rises. Disadvantages include the amount of space taken up by the cylinders because the engine is not modified to use any fuel other than gas, and the need of high pressure. The system also accomplishes a 90% reduction in emission of gaseous contaminants.

16198

Bernhart, Alfred

AIR POLLUTION CONTROL EQUIPMENT FOR CARS. Eng. J. (Toronto), 51(12):13-16, Dec. 1968. 15 refs.

In North American cities, cars, trucks, and aircraft contribute 67% of the air pollutants; in Los Angeles, the percentage is 90%. At 30 mph, the average car emits 80 gm m/hr of exhaust gases which contain 19 lbm/hr carbon dioxide, 1.5 lbm/hr carbon monoxide, 0.5 lbm/hr hydrocarbons, 0.5 lbm/hr nitrogen oxides, 4 grm/hr of lead particles, and 0.5 to 0.7 micrograms of benzo(a)pyrene. Engine exhausts contribute 97% of the total carbon monoxide emission, plus 60% of the total hydrocarbons, plus 100% of the nitrogen oxides; crankcase ventilation, 3% of the total carbon monoxide, plus 25% of hydrocarbons; carburetor, 3 to 10% of hydrocarbons; and the gasoline tank, 10 to 15% of the hydrocarbons. Combinations of crankcase emission return systems, evaporation proof carburetors and gasoline tanks, crankcase control devices, engine modification systems, or air injection systems should reduce daily emissions to 2.5 lbm of carbon monoxide, 0.05 lbm of hydrocarbons, and 0.08 lbm of nitrogen oxides. The devices will not reduce carbon dioxide emissions, which are expected to increase from 40 to 52 lbm per day. The cost of these devices will account for only 1.5% of the purchase price of a car.

16199

Pitts, F. S.

SUBMARINE ATMOSPHERES AND AIR POLLUTION. Scientific, 104(887):358-376, 1968. 9 refs.

The development of air purification and oxygen replenishment systems for submarines is reviewed. The absorption of carbon dioxide, which constitutes about 1% of submarine atmosphere, was usually accomplished by soda lime in the 1910's and by lithium hydroxide in the 1930's and 1940's. Even today these are the preferred absorbents when logistics permit replacement of used canisters or when submergence is less than two weeks. Regenerative procedures must be used during the extended submergence of nuclear submarines. Carbon monoxide concentrations are kept within threshold limit values by catalytic hydrogen burners, which also burn most of the hydrocarbon pollutants. Since the major source of hydrocarbons is galley fats, it is advisable to refrain from frying for a month prior to and during submergence. Of other trace contaminants, methane is most resistant to catalytic combustion. Its sources are refrigerator gases and aspic systems. Other sources of gases include solvents, fluorinated oils and greases, radiation, diesel fuel, shaving lotions, and chemical fluids. By controlling the quantity of these items, the contaminants are kept to a few ppm at the most. An adequate supply is provided by electrolytic generators that decompose water into oxygen and hydrogen. Radioactivity precipitators remove most of the aerosols from cooking and other sources, and filter cans of the other aerosols and adsorptive types. The equipment is discussed in terms of its application to open atmospheres.

16169

Lang, Ludvig

AN APPARATUS FOR CLEANING THE EXHAUST GAS OF AN INTERNAL COMBUSTION ENGINE. [Reinigungsvorrichtung für Abgase von Brennkraftmaschinen]. Text in Japanese. [Paul Heinrich Pittelkow, Germany.] Japanese Pat. Appln. 30525. 6p., Sept. 3, 1959. 1 ref. [Appl. Sept. 7, 1956].

With conventional cleaners for engine exhaust, difficulties arise in activating the catalyst at low temperatures and keeping the temperature constant without overheating the catalyst. The present invention provides a solution to these problems of catalytic exhaust gas. Exhaust gas is injected with air before reaching the catalyst chamber which consists of two parts, one a blender and the other the catalyst housing. The catalyst is formed into a basket shape. Its upstream side is covered with a stream-lined thin, solid shell without a hole, its downstream also with a shell with grooves or holes. One converging passage is provided around the catalyst along the inner wall of the chamber and another converging channel provided along the center line of the catalyst. The end of the channel is partially or totally closed. The device is a key to the present invention and is a kind of improved bypass system. The catalyst oxidizes both carbon monoxide and gaseous hydrocarbons. When the engine speed is low, e.g., below 60 km/h, the mixture of air and gas is led through the catalyst. When the speed is high, the gas mixture is bypassed around the catalyst, since the catalytic reaction is not required at high temperatures.

16187

Chihiro, Hiroo

EXHAUST GAS CLEANER. [Haikigasu seijoki]. Text in Japanese. Japanese not given. [Japanese Pat. 31000-31004. 5p., Sept. 28, 1959. 3 refs. [Appl. May 17, 1956].

An insulated chamber is located behind an engine manifold. The interior of the chamber is kept at around 1000 C and preheated fresh air. Exhaust gas components such as carbon monoxide or hydrocarbons are instantly burnt away. The device of the present invention comprises a combustion chamber, a heat insulator, a protector, and a stirrer. The cylindrical combustion chamber is composed of heat-resistant metals. The heat insulator, which consists of layers of pulverized insulators surrounds the combustion chamber. The protector houses the heat insulator, and is first heated in the protector before entering the combustion chamber. Inside the combustion chamber, a stirrer is provided to mix the exhaust gas with the air. Since carbon monoxide oxidizes at 600-650 C, and hydrocarbons at 800-900 C, the chamber temperature is kept enough. The merits of the invention are that no catalysts are used and that the chamber is compact enough to be installed in narrow spaces near the engine. There is no loss in engine power.

16497

Bowser, Walt

AMMONIA ABSORPTION: REFRIGERATION SELECTED FOR GASOLINE PLANT. Refining Eng., vol. 29:C35 to C38, July 1957. 1 ref.

A 200-ton capacity ammonia absorption refrigeration unit at a gas processing plant chills incoming gas to 0 F for the separation of gas liquids. The only moving component in the system is an ammonia liquor pump; widely varying loads are automatically handled with no mechanical adjustments required. Power requirements are directly proportional to the refrigeration load. Liquid recovery, based on the total available in the incoming gas stream, is propane, 90%; butanes, 97%; and 10 GPM natural gasoline, 95%. This corresponds to a total liquid recovery of 75,000 gal per day, including 8600 of propane, 7500 of butanes, and 9600 of natural gasolines. The operation of the ammonia refrigeration system, low temperature gas separator, and ammonia fractionator is given in detail. Advantages of the absorption refrigeration system are its low costs and operating flexibility. Though taking up more room than a compression plant, the absorption unit is constructed entirely out-of-doors; no buildings are needed to protect the equipment. In small size ranges, the initial costs of absorption systems are relatively high, varying from $700 to $1500 per ton of refrigeration. In contrast, initial costs for units over 100 tons are less than $400 per ton.

16535

BENZENE AIR PURIFICATION AND SOLVENT RECOVERY IN GRAVURE PRINTING. Gravure, 1960:10-12, 64, March 1960.

The operation and economic aspects of a toluene solvent recovery system for gravure printing shops are reviewed. Exhaust air from rotary presses is first forced through a filter to extract paper dust and small paper particles and then through one or several parallel adsorbers filled with activated carbon. Continuous operation requires at least two adsorbers which can be charged and regenerated alternately. Regeneration of the activated carbon is accomplished by steam treatment, followed by drying and cooling in vessel placed underneath the activated carbon layer. The economic operation of the recovery system depends on a high solvent concentration in the exhaust air and on automatic operation. To eliminate variations in solvent content of the exhaust gas, each exhaust pipe on the individual printing units can be equipped with a shutter that closes automatically as soon as the web ceases to a standstill; air free of solvent cannot be exhausted. The solvent content of air from the adsorbers is measured by continuously functioning analyzers. When small amounts of solvent are detected, the adsorber in question is automatically shut off from the exhaust air stream. Estimated operating costs for recovering 90% or more of the toluol used during printing are between $15-30 per long ton of toluol recovered.

16445

Varshavskiy, Ya. L. and B. V. Gerasin

PROTECTION OF CITY AIR FROM MOTOR VEHICLE EXHAUST GASES. (Zashchita vozdukha gorodov ot vykhlopnykh gazov avtotransporta). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Sanitarnyye voprosy okhrany vozdukha i vodnogo basseyna gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel'nik, 1968, p.56-61.

Carbon monoxide and hydrocarbon levels in areas of heavy traffic in Moscow exceed permissible levels by as much as tenfold, even though these conditions are far better than in U. S. or West European cities. Studies made in the USSR have shown that the CO emission per km of travel of a motor vehicle depends on the travel speed, road quality, and fuel system, but has little connection with the amount of carbon monoxide given off during idling. Some 50 stations for dynamic testing of individual cars for harmful emissions have been set up in Moscow. These stations make about 500,000 tests per year. Various means of improving combustion and eliminating crankcase fumes are reviewed. The use of electric cars, especially those utilizing direct conversion of chemical energy of a fuel to electrical energy, is seen as the ultimate answer to this problem. Research in this area is being carried out in the USSR.

16446

Salonja, N. G.

CONTROL OF AIR POLLUTION DUE TO PETROL ENGINES. Chartered Mech. Engr., 15(7):301-305, July 1968. 22 refs.

Four sources of major pollutants from vehicles are discussed. The exhaust accounts for 65%; the crankcase, 20%; and the carburetors and fuel tank, the remainder. Among engine design features, the fuel-air system has the greatest influence on the emission of pollutants. Fuel injection systems, although more expensive, eliminate the drawbacks of carburation. Variations in fuel composition have little influence on exhaust emission. The U. S. legal limits for carbon monoxide, hydrocarbons, and nitrogen oxides in exhaust gasses are given. Methods, such as the Ross-air-gap system, of reducing CO as well as hydrocarbon pollutants are discussed. The most useful future developments will be those that improve the performance of the fuel-air induction system, the exhaust manifold, catalytic converters and after-burners. In addition, the concentrations of pollutants in the atmosphere of busy thoroughfares injurious to health must be determined.

16447

Foster, J. W.

ADSORPTION PROCESSES. Chem. Process Eng., 47(8):37-44, Aug. 1966. 30 refs.

The fundamental principles of adsorption by molecular sieves for the preparation of high-purity, anhydrous gas streams, the concept of "zero transfer zone," has been utilized in the design of air-fresh, dual catalytic and continuous adsorption are surveyed. The application of adsorption techniques provides pure hydrocarbon feedstocks free from sulfur compounds, water, and carbon dioxide. The physical features of useful adsorbents such as activated alumina, silica gel and activated charcoal are characterized. The amount of adsorbate an adsorbent material will take up at equilibrium is important in determining the working capacity of adsorption equipment. A single circuit of a fixed adsorber bed, the most widely-used form of adsorption plant, is shown and discussed.

SEE PAGE 1041 IN PART II FOR COMPREHENSIVE INDEX

U. S. GOVERNMENT PRINTING OFFICE : 1970 O - 000-000

HYDROCARBONS AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

Part II, Categories F to M and Indexes

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service

Sponsored by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va. 22151

HYDROCARBONS AND AIR POLLUTION:

AN ANNOTATED BIBLIOGRAPHY

PART II

Office of Technical Information and Publications
Air Pollution Technical Information Center

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service
National Air Pollution Control Administration
Raleigh, North Carolina
October 1970

The AP series of reports is issued by the National Air Pollution Control Administration to report the results of scientific and engineering studies, and information of general interest in the field of air pollution. Information reported in this series includes coverage of NAPCA intramural activities and of cooperative studies conducted in conjunction with state and local agencies, research institutes, and industrial organizations.

National Air Pollution Control Administration Publication No. AP-75

For sale by the Superintendent of Documents, U.S. Government Printing Office

CONTENTS

PART II.

F. Effects - Human Health 553
G. Effects - Plants and Livestock 737
H. Effects - Materials 771
I. Effects - Economic 777
J. Air Quality Measurements 781
K. Legal and Administrative 949
L. Standards and Criteria 965
M. Basic Science and Technology 977

AUTHOR INDEX 1001
TITLE INDEX 1061
SUBJECT INDEX 1147
GEOGRAPHIC LOCATION INDEX 1161
United States 1161
Foreign 1162

F. EFFECTS — HUMAN HEALTH

00095

G.J. Doyle, H. Sadow, J.L. Jones

SULFUR DIOXIDE GAS IN EYE IRRITATION. Arch. Environ. Health, Vol. 3:587-597, Dec. 1961.

An eye-irritation panel was exposed to steady-state reaction mixtures generated in a 520 cu. ft. irradiated stirred-flow reaction chamber. The reactants for one set of experiments were usually 0.2 to 2.0 ppm by volume of olefins and NO in purified air. Reaction residence times ranged from 1 to 2 hrs. SO_2 was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were evaluated for relative eye-irritating ability, with and without SO_2. Aerosols derived from the co-photo-oxidation of SO_2 and true SO_2 itself probably have little effect on the eye-irritating ability of irradiated reaction mixtures. The net effect of the addition of SO_2 to the olefin reaction mixtures is a slight decrease in eye irritation accompanied by the appearance of an aerosol. Trace concentrations of halogenated internal olefins, specifically 2-methyl-2-butene, and of a cyclic olefin, cyclohexene, can produce significant amounts of irritants other than formaldehyde and acrolein. While no conclusions on the identity of these irritants can be drawn from the data, it is speculated that they may be compounds of the PAN type and/or reactive or unstable reaction intermediates. The use of dynamic (stirred-flow) conditions considerably enhances the sensitivity of subjects to the irritants. Indications are that small changes in the flow field about a subject's eyes may have large effects on response to the irritants in the flowing air. Adding isobutane, a branched-chain paraffin having a tertiary hydrogen atom, to a photooxidizing isobutylene-NO_x mixture produced no significant effect, either on the course of the reaction or on the eye irritation. This finding held true both with and without SO_2. A small decrease in eye irritation was experimentally observed, but there are not sufficient data to demonstrate that this effect is statistically significant. The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants. Ethylene and propylene, olefins important in auto exhaust, can produce significant eye irritation at realistic atmospheric concentrations.00

00096

E.C. Beck, A.A. Thomas, C. Savage

DEVELOPMENT OF SPACE CABIN TOLERANCE CRITERIA TO TRACE CONTAMINANTS. Biomedical Lab., Wright-Patterson AFB,

Ohio, and Midwest Research Inst., Kansas City, Mo. 1958. Presented at the 53rd Annual Meeting, American Medical Association, Atlantic City, N.J., April 1958. 11 pp.
OTSTI, Doc: AD 276202

This report reviews the problems encountered when attempting to establish criteria for bruce cable environments. Space cabin designers have used speculative figures derived from industrial threshold limit values (TLV) for tolerable contaminant concentration levels. Values of 10ppm (by vol.) are cited for CO; 5%, CO2 and paraffinic hydrocarbons; 50 ppm are cited for NO2, indole, skatole, NH3 and methyl mercaptan. The TLV criteria were designed for use for 8 hr. exposures for a 5-day work week over a 50-yr. span and extrapolation for longer continuous exposure is not necessarily valid. To test the validity of such extrapolations, the physiological changes in animals have been studied during 90-day continuous exposures to the various toxic vapors and gases listed. Results have proven that the TLV criteria cannot be used for long term exposure. There are apparently physiological actions and interactions between different contaminants which may be categorized as additive, synergistic or possibly antagonistic. Also, some animals appear to have a tolerance for these contaminants.BB

00174

H. Heimann (HEA-)

AIR POLLUTION RESEARCH PLANNING SEMINAR (PROCEEDINGS). Public Health Service, Cincinnati, Ohio. Division of Air Pollution. Dec. 20, 1956. 183 pp.

This document contains discussions of various participants in the seminar which reviewed the trends of air pollution research. Research results, interpretations, theories, and programs are discussed.BB

00175

R. R. Ahmi and R. R. Talbot

IN VITRO PULMONARY COMPLIANCE AND PHYSIOPATHOLOGY OF GUINEA PIG LUNGS REPEATED IN VIVO TO GADOLINIUM OXIDE DUST. Iowa State Univ. of Science and Tech. Ames. Coll. of Veterinary Medicine. Inst. for Atomic Research (Rept. No. COO-1170-7.) June 1965. 77 pp.

Seventy-two guinea pigs were divided into three groups of twenty-four each. Each group consisted of twelve control guinea pigs, and twelve pigs exposed to an aerosol of 20 mg. of gadolinium oxide per cu ft of air for periods of 240, 480, and 820 exposure hours. After the exposure period, the lungs were removed and compliance measurements made. Analysis of the data by a three-way factorial analysis revealed a significant interaction

between the treatment and duration of exposure factors. Further analysis for trend disclosed a highly significant linear trend with time in the exposed groups. Histopathological changes in the exposed groups, and the amount of deviation from control lung tissue presupposed a difference in functional ability between the two groups. The histopathological changes included alveolar cell hypertrophy, septal cell thickening, lymphoid hyperplasia, and neoplastic formation. (Author) Abstract,EE

00195

W. Rotin and H. L. Falk

ATMOSPHERIC CARCINOGENS. Southern California Univ., Los Angeles, School of Medicine. 1965. 6 pp.

A critical review of the data relating to the role of carcinogenic polycyclic aromatic hydrocarbons reflects virtual unanimity that within the limits of current knowledge these agents alone are unlikely to be the exclusive or necessarily the primary factors in the initiation of bronchogenic carcinoma. This presentation, therefore, will attempt to cover a broader area. The discussion of carcinogenic agents in polluted air on distinct chemical and physical entities is perhaps proper, but from a biological viewpoint it is a misleading oversimplification to assume that their potential effect is independent of the action of numerous exogenous and endogenous factors. While the remarks will be limited to atmospheric carcinogens because of the theme of this conference, it will be emphasized that the principles developed during the discussion, if valid, should be applicable to several environmental sources suspected of being etiologically concerned with lung cancer. (Author)EE

00210

A. B. Josephson

IMMUNOLOGIC RESPONSE TO THE NITRO-OLEFINS. Preprint. 1965.

The conjugated nitro-olefins have been shown to be effective agents in provoking the delayed contact reaction in guinea pigs. Studies of a variety of substituted and unsubstituted, saturated and unsaturated hydrocarbons indicate that only the conjugated, nitro-substituted compounds are sensitizers. Examination of cross-reactivity between nitro-olefins of differing chain length indicates specificity of the contact reactions dependent upon the size of the haptenic moiety. (Author's abstract)EE

00259

H. H. Landsberg

WEATHER AND DISEASE. Environmental Science Services

Administration, Washington, D.C. Weather Bureau. Technical Note TN-ENR-1, [PB164, 2nd. ed.], 1965. 1966. 7 pp. 6p6ff

The atmospheric environment can cause sunburn, heatstroke, and frostbite. Air pollution may provoke or aggravate asthma. Weather changes often influence gout and arthritic pains. There are suspicions that the course of respiratory and certain heart ailments is influenced by atmospheric conditions. Indirectly, through influences on disease vectors, the climate plays a role in tropical diseases. Favorable climatic conditions, on the other hand, may alleviate the symptoms of various diseases. (Author's abstract)66

00301

H. Heimann, L. O. Kuik, R. A. Prindle, and W. H. Pinker

PROGRESS IN MEDICAL RESEARCH ON AIR POLLUTION. Public Health Repts., 73(12):1055-1069, Dec. 1958. (Presented at the National Advisory Committee on Air Pollution, Cincinnati, Ohio, Aug. 28, 1958.)
6P0: 1303

For 3 years the Air Pollution Medical Branch of the Division of Special Health Services has been working in the increasingly more important but relatively unexplored field of air pollution in its specific relation to human health. The work began with a search for and a systematic appraisal of the scattered sources of knowledge, followed closely by tentative explorations into those parts of the problem holding promise of significant findings. Sufficiently successful results of initial activities helped chart the present course of action, which, in turn, points toward areas requiring emphasis in the future. (Authors' abstract)66

00308

H. Heimann

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. World Health Organization Monograph Ser., No. 46 (Air Pollution), p. 159-220, 1961.

As one chapter of a WHO Monograph on "Air Pollution," this paper covers the state of knowledge and world trends in research on the effects of such pollution on human health. The acute air pollution episodes in the Meuse Valley, Donora, London, and Poza Rica are reviewed. Data, causes, and effects for each episode are discussed. The symptoms of illness and organic and systemic effects resulting from major pollutants such as carbon monoxide, sulfur and nitrogen oxides, ozone, beryllium, fluorides, aeroallergens, carcinogens and pesticides are described. Further research to demonstrate that specific pollutants or combinations thereof can cause ill health is urged in order to obtain data to balance health effects against economic aspects for the purpose of cleaning the air. The various allowable concentrations for community air, published by

the Russians, are considered inadequate to solve the air pollution problem. However, studies already made of the effect of low-level concentrations have been used as a basis, despite controversy, to reduce pollution in many locations.00

00310

P. J. Lawther, A. B. Hastie, and R. T. Waldron

EPIDEMIOLOGY OF AIR POLLUTION (REPT. ON A SYMPOSIUM). Public Health Papers, No. 15, 1962, 82p.

This symposium held in Copenhagen in December 1960, was attended by participants from fourteen European countries. Although in some areas current methods of control are resulting in cleaner air, in others air pollution is increasing both in the chemical complexity of its composition and in the extent of the areas affected. Motor traffic is the cause of growing anxiety in many areas because of the emission of carbon monoxide, of lead compounds, and of polycyclic hydrocarbons with suspected carcinogenic properties. Air contaminants are also discharged in wide variety in many chemical and other industrial processes and may be responsible for local problems of a specialized character. The symposium, however, was primarily concerned with the general pollution of urban areas resulting from the use of domestic and industrial fuels, of which the most frequently used indices are dustfall, suspended matter, and sulfur dioxide. (author)00

00429

A. A. Thomas

LOW AMBIENT PRESSURE ENVIRONMENTS AND TOXICITY. Arch. Environ. Health Vol. V, 316-322, Sept. 1962. CFSTI, DDC: AD 610 565

A unique inhalation exposure facility has been built to study the effects of low atmospheric pressure and oxygen-rich atmospheres on the characterization of truly uninterrupted, long-term, continuous exposure to toxic chemicals. The first experiments reported herein include exposure of a large number of mice, rats, dogs, and monkeys to graded doses of ozone, nitrogen tetroxide, and carbon tetrachloride in a 100% oxygen atmosphere at 5 psi pressure for 7 weeks duration. Further, a 90-day exposure to 7 psi 100% oxygen of a similar animal complement is also reported. Biochemical and pathologic changes related to toxic exposure are discussed together with the future experiments planned for this facility.00

00473

F.G. Hueter, G.L. Contner, R.A. Busch, B.G. Hinners

BIOLOGICAL EFFECTS OF ATMOSPHERES CONTAMINATED BY AUTO EXHAUST. Amer. Environ. Health 12, 551-60, May 1966. (Presented at

the 59th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1966.)

This report represents a status summary of the biological results obtained from the chronic exposures of experimental animals to various concentrations of irradiated and unirradiated auto exhaust for periods of 6 weeks to 21 months. The chronic exposure of experimental animals to various concentrations of irradiated and unirradiated auto exhaust-air mixtures resulted in significant biological effects indicating the following: irradiated auto exhaust (1) increases the susceptibility to pulmonary infection and chronic disease during the latter half of the animal's lifetime, and (2) markedly decreases mouse fertility and decreases the survival rate of infant mice; both raw and irradiated auto exhaust cause a stress and adaptation response in mice as measured via spontaneous activity, increased blood lead concentrations, and increase the amount of hypertrophied or abnormal lung tissue. No experimental atmospheric effects were observed concerning; mortality, histopathology, growth-bodyweight, teratology, hematology restricted to erythrocyte count, erythrocyte cell size distribution, hematocrit or hemoglobin concentration, blood pH and CO2 values, oxygen consumption, or pulmonary function in relation to permanent impairment. Further studies are indicated to elucidate more fully the affected biologic parameters.##

00499

R. Cuca and G. G. Burton

THE CONCENTRATION AND DISTRIBUTION OF IRRITANTS IN POLLUTED ATMOSPHERES. Preprint. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., May. 2-6, 1966.)

Consideration of reasons recorded U.S. concentrations of single gaseous or particulate pollutants indicated that alterations in airway resistance and lung compliance in animals or man have not been demonstrated after inhalation of single irritants at these concentrations. At this time it is difficult to speculate on the acute or chronic changes produced, if any, in these functional measurements by inhalation of complex mixtures of low concentrations of individual irritants. Certainly, eye irritation demonstrates that effects which are not predictable on the basis of the action of a single irritant are produced by mixtures of irritants. Airborne particulate irritants should be assessed with respect to aerodynamic particle size, because (1) chemical composition of particles has been demonstrated to vary with size and (2) only certain particle sizes present in polluted atmospheres are capable of reaching receptors after inhalation by man. Among the defects of present routine sampling methodologies are: (1) size distribution of sampled particles is not known; (2) the optimum density of sampling stations for the procurement of reliable results is unknown, and (3) the irritant potential of pollutant mixtures is not taken into account when single pollutants are evaluated. (Author summary)##

00518

B. Dawicki

AIRBORNE CARCINOGENS AND ALLIED COMPOUNDS. Preprint. Arch. Environ. Health 14(1):156-62, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-5, 1966.)

The bimillionfold range in concentrations of some of the known components of the urban atmosphere is presented. The variation is from 0.2 to the 6th power micrograms/1000 cu.m for CO2 to 0.2 micrograms/1000 cu.m for dibenz(a,h)acridine. A wide variety of large organic compounds are found in the urban atmosphere. Some of the families of compounds which have been identified include n-alkanes, proteins, aromatic hydrocarbons, azo heterocyclic compounds, nitro heterocyclic compounds, polynuclear carbonyl compounds, quinones, acids, and phenols. Four types of carcinogens have been found in the urban atmosphere. These include polynuclear aromatic hydrocarbons, polynuclear azo heterocyclic compounds, polynuclear nitro heterocyclic compounds (in air polluted by coal-burning homes), and polynuclear ring carbonyl compounds (carcinogenicity needs confirmation). The presence of alkylating agents in the aliphatic and other fractions of airborne particulates indicates the probable presence of antagons and other as yet unisolated types of carcinogens. The number and type of carcinogens found in the atmosphere indicate that attempts to correlate carcinogenicity of the mixtures in our chemical environment with the concentrations of benzo(a)pyrene are probably naive in most cases, and spring from lack of knowledge of the composition of the mixtures. In the case war, not much can be said about the anticarcinogens and co-carcinogens in the atmosphere until the composition of environmental mixtures is better understood. (Author abstract)00

00633

A.P. Altshuller, D. Kleinerman, P.B. Leach, and J. B. Digaby, Jr.

THE PHOTOOXIDATION OF SINGLE AND MULTI-COMPONENT HYDROCARBON - AND ALDEHYDE - NITRIC OXIDE MIXTURES IN AIR UNDER DYNAMIC AND STATIC FLOW CONDITIONS. Preprint. 1966.

An investigation has been made of the chemical, aerosol plant damage, and eye irritation effects of irradiating various single hydrocarbon - aldehyde or multi-component hydrocarbon - NO systems under dynamic flow conditions. The systems investigated included the following individual hydrocarbons which were irradiated in the presence of NO (and traces of NO2): ethylene, 1-butene, 1,3-butadiene, toluene, xylene, and 1,2,3-trimethylbenzene; n-hexane, 3-methylpentane, 2,4,4-trimethylpentane, and cyclohexane. Mixtures of hydrocarbons including ethylene and 1-butene; ethylene, 1-butene, and trans-2-butene; and ethylene, 1-butene, trans-2-butene, and mixed xylenes also were irradiated in the presence of nitrogen oxide in air. In addition the photooxidation of the formaldehyde - oxygen,

propionaldehyde - oxygen, formaldehyde - NO and propionaldehyde - NO systems were investigated. In these dynamic irradiation experiments the 9 paraffinic hydrocarbon - NO systems produced neither oxidant nor plant damage. In all of these systems NO was only partially converted during irradiation and NO_2 did not peak. When 0.5 ppm of ethylene, 0.5 ppm of an ethylene - butene-1 mixture, or 0.5 ppm of xylene was irradiated with 1 ppm of NO no net oxidant and no plant damage occurred. At ethylene or toluene concentrations between 3 and 6 ppm with 1 ppm of NO, irradiation produced oxidant but no plant damage of either the ozone or PAN type. Many of these mixtures did react somewhat with the disappearance of part of the hydrocarbon and the formation of significant yields of formaldehyde or aliphatic aldehydes. Propionaldehyde when irradiated in the presence of small traces of nitrogen oxides produced severe plant damage. (Author abstract)##

00830

W. B. Deichmann, W. E. MacDonald, S. F. Leape, I. Dressler, and W. A. D. Anderson

NITRO-OLEFINS AS POTENTIAL CARCINOGENS IN AIR POLLUTION. Ind. Med. Surg. Vol. 35:800-807, Oct. 1966. (Presented at the 23rd International Congress of Physiological Sciences, Tokyo, Japan, Sept. 1-9, 1965.)

The 21 possible linear, internally conjugated nitro-olefins having from four to nine carbon atoms were synthesized and their pharmacological and physicochemical properties studied. The eye-irritating properties of three representative nitro-olefins were investigated in a joint study with members of the staff of the Los Angeles County Air Pollution Control District. The acute toxicity of each of the compounds was investigated by inhalation, oral, intraperitoneal, and cutaneous routes, using rabbits, guinea pigs, rats, mice, chicks and dogs. The subacute inhalation toxicity of each of four nitro-olefins representative of the series was studied, using rabbits, guinea pigs, rats and mice. Nitro-olefins were identified in the exhaust of a one-cylinder, four-cycle internal combustion engine. When isobutylene was used as fuel, 1-nitro-2-methyl-1-propene were produced. When 3-hexene was used, 3-nitro-3-hexene was identified in the exhaust. (Author summary)##

00838

F. A. Haskins

OCTOBER 1961 NEW ORLEANS ASTHMA STUDY. Arch. Environ. Health Vol. 12:295-304, Mar. 1966.

This paper reports on aerometric activities carried out in New Orleans from Oct. 1 through Nov. 5, 1961. The objectives of these activities were to establish any difference in air quality between asthma outbreak days and other days, evaluate geographic and temporal variation in pollution characteristics, and evaluate various uncommon methods of measuring air pollution. (Author abstract)##

00639

R. B. Gardner

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. III. LUNG TUMORS IN MICE. Arch. Environ. Health Vol. 12:305-313, Mar. 1966.

This paper reports the long-term effect of inhaling Los Angeles ambient air upon the incidence of lung adenomas in several inbred strains of mice. Despite the absence of histopathologic evidence for any specific acute effect related to ambient air pollution in the experimental mice colonies, the statistical evidence of this study indicates a strong likelihood that ambient Los Angeles atmosphere does possess a definite though slight activity in promoting pulmonary adenomatous tumors in aging inbred mice. These findings offer further evidence that some lung tumorigenic activity does exist in the indigenous respiratory environment.##

00658

F.L. Bates, C.H. Pan

RESPONSE OF ENZYME SYSTEMS TO PHOTOCHEMICAL REACTION PRODUCTS. Arch. Environ. Health Vol. 10(2):207-212, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Exposure to photochemical reaction products inhibited the activity of glutamic dehydrogenase from Escherichia coli. With a glutamate substrate the inhibition increased at a rate comparable to the inhibition of the growth of the cells. Considerably less inhibition was observed for the reaction in the reverse direction. With increasing formaldehyde concentrations, the reaction of glutamic dehydrogenase from mammalian source was more rapidly inhibited in the reverse than in the forward direction. From the data to date, it appears that only at very low concentrations could formaldehyde produce the relationship of the reactions observed with the photochemical reaction products. There is no evidence, however, that such concentration would produce comparable magnitudes of inhibition with time. (Author summary)##

00661

S.S. Epstein

PHOTOACTIVATION OF POLYNUCLEAR HYDROCARBONS. Arch. Environ. Health Vol. 10(2):233-239, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

This review presents some incomplete studies having three principal objectives: (1) to study photodynamic mechanisms as a parameter of activity of polynuclear carcinogens; (2) to determine the nature of the correlation existing between photodynamic and carcinogenic activities in the class of polynuclear compounds;

and (3) to determine whether the degree of photodynamic activity of crude organic mixtures, such as air pollutants, could provide a useful and rapid biological measure of presumptive carcinogenic hazard to man, attributable to polynuclear compounds. Prior to separate consideration of these three objectives, the basic techniques used in these studies were briefly described.##

00668

W.W. Crocker, B.I. Nielsen, I. Iannitchi

CARCINOGENIC HYDROCARBONS (EFFECTS ON ROCKLING RAT TRACHEA IN ORGAN CULTURE). Arch. Environ. Health Vol. 10(2):250-256, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

The present report describes organ cultivation of suckling rat trachea and the response of this tissue to exposure to three known carcinogenic hydrocarbons. In some instances, contact with the hydrocarbon was terminated to test either recuperative function of the tissue or persistence of the influence of the carcinogen.##

00750

R.L. Falk P. Kotin

AN ASSESSMENT OF FACTORS CONCERNED WITH THE CARCINOGENIC PROPERTIES OF AIR POLLUTANTS. Nat. Cancer Inst. Monograph (9) 81-9, 1962. (Presented at a Symposium on The Analysis of Carcinogenic Air Pollutants, Cincinnati, Ohio, Aug. 29-31, 1961.)

The presentation is devoted primarily to the representative carcinogenic polycyclic hydrocarbon, benzo(a)pyrene. The biological significance of particle size of naturally occurring benzo(a)pyrene is considered. Along with carcinogenic polynuclear hydrocarbons, carcinogenic agents of a different chemical nature occur in the atmosphere. These may act as cocarcinogens or may otherwise affect the action of benzo(a)pyrene. Noncarcinogenic chemical and biological agents in polluted air also may affect the biological action of carcinogenic agents, as may the simultaneous presence of related compounds. Anticarcinogenic action may be related to the ratio of the compounds, to one another and to the stability of both carcinogenic and noncarcinogenic compounds in the atmosphere. In vehicle exhaust studies further modifying factors are the conditions of engine operation and the variations in proportion of compounds due to atmospheric exposure. Further, the solvent or vehicle effect modifies the rate of entry of carcinogenic agents through epithelial surfaces and their subsequent anatomic distribution. The metabolism of polycyclic aromatic hydrocarbons in the liver and associated metabolic alterations are considered. (Authors' abstract)##

00756

D. Saffiotti, F. Cefis, L.H. Kolb, F. Shubik

EXPERIMENTAL STUDIES OF THE CONDITIONS OF EXPOSURE TO CARCINOGENS FOR LUNG CANCER INDUCTION. J. Air Pollution Control Assoc., 15(1):128-35, Jan. 1965. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 1965.)

A method is described for the experimental induction of lung cancer. Syrian golden hamsters, receiving repeated intratracheal administrations of benzo(a)pyrene in particulate form carried by an inert dust, develop a high incidence of bronchogenic carcinoma. The conditions of exposure to the carcinogen, involving penetration and retention of carcinogen particles in lung tissues with the dust, are of prime importance in the determination of the results. Instillations of the same carcinogen in other media did not induce lung tumors. The relative importance of the identification of carcinogenic materials in air pollution and of the conditions of exposure in the origin of lung cancer is discussed. (Authors' summary)00

00779

H.E. Ewana, Jr., D. Brunol, L.G. Hayne, G.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. II. CHRONIC EXPOSURE OF GUINEA PIGS. Arch. Environ. Health. Vol. 11:765-769, Dec. 1965.

Guinea pigs have been directly exposed to ambient Los Angeles air for two years. Monthly measurements of their total expiratory resistance were made plethysmographically, and compared with those of guinea pigs breathing air filtered through activated-charcoal. Variations in resistance occurred from month to month, but no difference in resistance was noted between guinea pigs residing in ambient air and those living in filtered air. Total pulmonary resistance appeared to increase with aging. During the second year of their life span, the mortality of guinea pigs living in ambient air was slightly greater than of those living in filtered air, but this difference was not significant at the 5% level by the chi square test. (Author summary)00

00803

A.P.I. RESEARCH PROJECT AC-6 "TOXICITY OF AROMATIC HYDROCARBONS IN THE LUNG" (PROGRESS REPT. FOR NOV. 1, 1962 - OCT. 31, 1963 AND PROGRAM FOR 1964). Chicago Medical School, Ill., Inst. of Medical Research. 1963.

The first objective of this program, namely the experimental induction of bronchogenic carcinoma, has been achieved. The method used in these studies has given a very satisfactory result with the induction of a high incidence of

tracheobronchial tumors, with a relative short latent period and in very "clean" experimental conditions. The histological study of the treated lungs shows no unwanted side reactions such as chronic pneumonia or necrosis. The current experiments with different dosage levels of carcinogen will provide an initial understanding of the dose-response relationship in the pathogenesis of bronchogenic carcinoma. The results so far obtained suggest that repeated exposure to the carcinogen over a certain period of time is an essential factor. The role of associated factors will become amenable to experimental study; various factors have been associated epidemiologically with lung cancer induction in man, but these observations, without an experimental study of their role, do not provide final practical answers, because on e can not assess the relative importance of these factors on a quantitative basis or of different exposures to individual factors. A detailed study of of the histogenesis of bronchogenic carcinoma in these various conditions is also essential to the understanding of its pathogenesis. The present experimental model seems to lend itself satisfactorily to the study of all these problems.##

00809

N. Nikiteva A. Nikisha

TRICHLOROETHANOL IN TRICHLOROETHYLENE POISONING. Brit. J. Ind. Med. (London) 23, (2) 116-20, Apr. 1966.

Trichloroethylene and trichloroethanol were given intraperitoneally to guinea-pigs. Their effects were tested by measuring the threshold current intensity of electrical skin stimulation, the electrical excitability of the motor cerebral cortex, by recording and analysis of the electroencephalogram, and by electrocardiographic examination. The two compounds had similar effects on the nervous system and the heart, but trichloroethanol was the more effective by a factor of at least three. These results support the opinion of clinical investigators on the important role of trichloroethanol in the pathogenesis of trichloroethylene poisoning. (Author summary)##

00842

U. Saffiotti, S.A. Berg, R.I. Brota, D.B. Harp

RETENTION RATES OF PARTICULATE CARCINOGENS IN THE LUNGS. Chicago Med. School Quart. 24(2):10-17, 1964.

This report describes a series of preliminary chemical studies which were set up to investigate the rate of persistence of carcinogens in the lungs. These studies are necessary to gain clearer understanding of the mechanisms by which particulate carcinogens affect the respiratory tract to the extent of inducing bronchogenic carcinoma.##

00870

E. Sawicki, J.E. Meeker, E. Morgan

POLYNUCLEAR AZA COMPOUNDS IN AUTOMOTIVE EXHAUST. Arch. Environ. Health Vol. 11:775-775, Dec. 1965.

Evidence is presented that automotive exhaust contributes only a small percentage of the polynuclear aza carcinogens found in air. Air pollution source effluents, other than automotive exhaust, are important sources of polynuclear carcinogens found in the urban atmosphere. (Author summary)00

00883

E. Rinehold E. Feiner

HEALTH HAZARDS ASSOCIATED WITH WORK IN CONFINED SPACES. J. Occupational Med. 8(7):358-364, July 1966.

Safeguards for work in confined spaces were outlined under three broad categories: (1) testing and preparation of the confined space before entry; (2) use of precautionary measures during occupancy; and (3) assurance of the availability of prompt rescue and adequate first aid should an accident occur. In general, these safeguards can be enforced readily in large plants where they may be incorporated into existing safety programs, if they are not already part of them. However, application of these safeguards in small factories is not easy. Such establishments, in which most of the reported accidents occurred do not usually have adequate safety programs or supervisory personnel with clearly defined safety responsibilities. As a result, the necessary safeguards are not available to provide protection during confined space operations. The conspicuous absence of safe guards in small establishments is due primarily to ignorance of the potential hazards inherent in work in confined spaces. The cases discussed demonstrated the need for a vigorous educational effort, particularly in small plants, to minimize deaths and injuries due to work in confined spaces. (Authors' summary)00

00887

J.D. McEwen, J.E. McEnroe, E.H. Vernot, D.V. Harper

CHRONIC INHALATION TOXICITY OF CHLORODIBROMOMETHANE. J. Occupational Med. 8(5):251-256, May 1966.

Albino rats and beagle dogs were exposed to the inhalation of chlorodibromomethane vapors during 175 6-hr. exposures, 5 days per week over a 6-month period. The exposure levels of 500 and 1000 ppm chlorodibromomethane produced only one demonstrable effect, the

slight depression of growth in the albino rat. This finding, while statistically significant, was not associated with microscopic pathologic changes in tissues. The chlorobromomethane-exposed animals were normal in appearance, and not visibly different from the control animals. The blood bromide levels in both species were above 95 mg.% in the exposed animals. From the data presented, the most significant factor in chlorobromomethane intoxication is the serum bromide ion concentration resulting from the metabolism of the chlorobromomethane. It may be concluded from the present experiments and other experiments cited that the current acgih threshold limit value of 200 ppm for chlorobromomethane is a satisfactory working level for chronic daily exposure. (Author summary)##

00910

G. Y. Brady

A REVIEW OF PITFALLS AND PAST, CURRENT AND FUTURE RESEARCH IN THE FIELD OF AIR POLLUTION HEALTH EFFECTS. Preprint. (Presented at the Los Angeles County Medical Society, Air Pollution Section, Dec. 2, 1965.)

A general treatment of the reasons and rationale for health impairment in regards to air pollution. Salient points covered by author are: Host interactions measured on individual and among groups; Possible cumulative agent-environmental effects on the prevalence of types of morbidity and mortality; Suggestions for future research (medical research).##

00915

C. S. Weil, M. Condra, C. Haun, and J. A. Striegel

EXPERIMENTAL CARCINOGENICITY AND ACUTE TOXICITY OF REPRESENTATIVE EPOXIDES. Ind. Hyg. J., p.305-325, Aug. 1963.

Carcinogenic and acute toxicity potential were assayed while more than 60 epoxy compounds were being studied for commercial utility. Range-finding toxicity data are presented for 60; lifetime mouse skin painting results are given for 38, and mouse sebaceous gland suppression results are listed for 26 of these compounds. None of the 11 monoepoxides produced tumors while 5 of the 11 diepoxides were tumorigenic during lifetime skin painting of mice. The median latent period for tumor production with the diepoxides was 15 to 23 months. No generalities about the toxic, irritative or carcinogenic hazards are justified by the presently known facts. Each compound must be individually studied to determine toxicity and carcinogenicity potential. (Author abstract)##

00992

W.d. Jacobs, D.R. Johnston, L.A. Hipperton

EXPOSURE OF MICROORGANISMS TO LOW CONCENTRATIONS OF VARIOUS POLLUTANTS. Ind. Hyg. J., 25(6):595-600, Dec. 1964.

A technique for exposing microorganisms to air-borne toxicants was developed. Serratia marcescens were exposed to irradiated atmosphere of clean air, NoO at 0.5 ppm, hexane-1 at 3 ppm, and NoO plus hexane-1. Only those containing NoO differed significantly from clean air, suggesting that hexane-1 played no major role. The technique has inherent difficulties, limiting its application pending further development. (Author abstract)##

01015

F. Rotin and D. F. Hinsley

PRODUCTION OF LUNG CANCER IN MICE BY INHALATION EXPOSURE TO INFLUENZA VIRUS AND AEROSOLS OF HYDROCARBONS. Progr. Exp. Tumor Res. (Karger, Basel/New York) Vol 5:188-215, 1963.

Squamous carcinomas were induced in C57 black mice after successive infections with three mouse-adapted strains of influenza virus and continuous exposure to an aerosol of atomized gasoline. The progression of the pathological process from the initial proliferative response to influenza virus through squamous metaplasia with keratinization to the development of squamous cancer has been histologically described. The last two classes of changes were observed exclusively in mice concurrently exposed to the influenza virus and hydrocarbon aerosols.##

01020

F. C. Pybus

CANCER AND ATMOSPHERIC POLLUTION. Medical Proceedings (Medicus Bydroxon) Vol. 10(12):342-56, June 13, 1964; and Vol. 10(13):388-77, June 27, 1964.

Author discusses the relationship of cancer and air pollution insofar as the following categories are concerned: Tar and Soot as a Cause of Cancer in Humans; Benzpyrene in Tar, Soot and Smoke; Nature and Sources of Smoke in the Atmosphere and its Benzpyrene Content; Benzpyrene as a Universal Carcinogen; Air Pollution and Cancer; Tobacco Smoking and Cancer; Positive and Contradictory Evidence; Nature of Cancer; Cancer in Animals; Diagnosis and Treatment; Cancer Education; Legislation; and The Cost of Air Pollution.##

01025

S. S. Epstein, H. Small, J. Kaplan, S. Mantel, and H. H. Hoener

PHOTODYNAMIC BIOASSAY OF BENZO(A)PYRENE WITH PARAMECIUM CAUDATUM. J. Nat. Cancer Inst. Vol. 31(1):163-8, July 1963.

A bioassay for benzo(a)pyrene, based on its photodynamic toxicity to Paramecium caudatum, is described. This procedure permits convenient and rapid analysis of a large number of replicates with satisfactory reproducibility and sensitivity .* (Author summary)##

01029

P. Kotin, H. L. Falk, P. Nader, and M. Thomas

AROMATIC HYDROCARBONS. I. PRESENCE IN THE LOS ANGELES ATMOSPHERE AND THE CARCINOGENICITY OF ATMOSPHERIC EXTRACTS. Ind. Hyg. Occupational Med. Vol. 9(2):153-61, Feb. 1954. (Presented in part at a meeting of the Cancer Prevention Committee, N.Y., Nov. 3, 1953.)

The atmosphere of a large, urban, primarily petroleum-polluted community has been analyzed, and carcinogenic hydrocarbons have been demonstrated as part of the over-all picture of air pollutants. Extracts of atmospheric samples have been successfully used to produce skin papillomas and skin cancers on C57 black mice. The presence of aliphatic hydrocarbons and their oxidation products in the atmosphere is offered as being of significance in the pathogenesis of lung cancer, first, by providing an aliquot for the separation of adsorbed carcinogenic hydrocarbon from soot particles in the air and, second, by the formation of various chemical compounds from unsaturated hydrocarbons, including theoretically the formation of diepoxides whose experimental carcinogenicity has been reported. (Author summary)##

01030

P. Kotin and H. L. Falk

THE EXPERIMENTAL INDUCTION OF PULMONARY TUMORS IN STRAIN-A MICE AFTER THEIR EXPOSURE TO AN ATMOSPHERE OF OZONIZED GASOLINE. Cancer Vol. 9(5):910-917, Oct. 1956.

Strain-A mice have been exposed to an atmosphere of ozonized gasoline and to a washed-air control atmospheric environment. A significant difference was found in the test-chamber mice both in multiple-tumor-bearing animals. After forty weeks of exposure there were 21 per cent tumor-bearing animals in the control mice

compared with 61 per cent in our test sites. Differences between the multiple-tumor-bearing-animals have been more marked and greater significance is attached to this variation in terms of ascribing carcinogenic powers to the polluted atmosphere in our test chamber. Mice housed in a polluted atmosphere showed a consistent weight deficit when contrasted with their washed-air controls. While no statistical significance has been attributed to this in relation to tumor yield, the role of caloric restriction in depressing spontaneous and induced-tumor yield has been noted. The ubiquity of gasoline and the presence of its reaction products in urban atmospheres suggest that it be further investigated as a possible etiological influence in the increasing incidence of human lung cancer. Finally, the absence of aromatic polycyclic hydrocarbons from the test chamber may be properly regarded as establishing the innate tumorigenic powers of the chemical substances in the test chamber. (Author summary modified)00

01049

B. L. Larkin and R. E. Rupel

QUANTITATIVE ANALYSIS OF POLYVINYLPYRROLIDONE IN ATMOSPHERE SAMPLES AND BIOLOGICAL TISSUES. Am. Ind. Hyg. Assoc. J. Vol. 26(6):558-61, Dec. 1965.

A quantitative method for the analysis of polyvinylpyrrolidone (PVP), collected in atmospheric samples or extracted from biological tissues, is described. PVP is a component in many aerosol hair sprays. A 0.4% citric acid solution is used to collect or extract the PVP. The color is developed by using a potassium iodide reagent, and the intensity of the color is read on a spectrophotometer at a wavelength of 432 millimicrons. The low limit of detection for this method has been established at 0.5 microgram of PVP per milliliter of final solution. (Author abstract)00

01051

W.J. Hayes, Jr. C.I. Pirkle

MORTALITY FROM PESTICIDES IN 1961. Arch. Environ. Health Vol. 12:63-66, Jan. 1966.

There were 119 deaths in 1961 possibly related to pesticides, and 111 of these were ascribed to identifiable materials. About 90% of deaths attributed to pesticides were correctly diagnosed as indicated by evidence of adequate exposure, a consistent clinical course, or appropriate laboratory and autopsy findings. Of the 111 reasonably definite cases, 51% were in children under 10 years old; at least 58% involved compounds older than chlorophenothane (DDT); not more than 15% were occupational; and several cases were associated with alcoholic intoxication, mental deficiency, improper storage of the poison, or some other special circumstance. Safer use of pesticides in this country should be attainable because, especially in children, a few countries already have a lower mortality rate associated with these useful materials. (Author summary)00

01062

D.E. Rounds

ENVIRONMENTAL INFLUENCES ON LIVING CELLS. Arch. Environ. Health Vol. 12:79-83, Jan. 1966. (Presented at the Second American Medical Association Congress on Environmental Health Problems, Chicago, Ill., Apr. 26-27, 1965.)

This study included a consideration of only two environmental factors on an established human cell line: (1) hydrocarbon mixtures, which form a major contribution to air pollution in the Los Angeles area, and (2) a small portion of the spectral emission of sunlight. Ambient air volumes were scrubbed through either distilled water or chloroform in gas washing bottles. The resulting pollutants were suspended in water, flash sterilized, and added to double strength medium. These test solutions were compared with dilutions of a carcinogen, 3'-Me'DAB with respect to responses of an established line of human conjunctival cells in vitro. All test media produced (1) a growth stimulation, (2) an increase in chromosomal stickiness and scattering during mitosis, and (3) a decrease in a positive staining reaction for phospholipid. Treatment of conjunctival cells with either a chloroform extract of auto exhaust or a five-minute exposure to near ultraviolet light produced no marked morphological change. The combination of these treatments induced cytolysis within two hours. (Author summary modified)##

01077

F. F. Lubowe

THE EFFECT OF AIR POLLUTANTS ON THE SKIN. "DERMATITIS URBIS." General Practice 27(5):10-1, 27, May 1963.

In older individuals the visible signs of aging skin may become more apparent when continuously exposed to air pollutants. Thus, the existence of a condition which may be referred to as "city skin" is conceivable. It appears justified to conjecture that the pollutants which present respiratory hazards, with continuous long-term exposure, will also affect the epidermis and cutaneous system. The deposition of soot and dust on the skin affects bacterial growth and subsequent physiological activity. Contact dermatitis due to airborne contactants such as smoke and insecticide sprays is common, as well as industrial dermatoses related to acids, organic sulfides, and other substances. It seems logical to attribute the dermatoses of the hands and face to the irritating pollutants of industrial cities. Prophylactic as well as remedial topical formulas must be devised to overcome this insidious effect of air pollution.##

01080

L. P. Davignon, J. St. Pierre, G. Chaconi, and F. J. Toutangeau

A STUDY OF THE CHRONIC EFFECTS OF INSECTICIDES IN MAN. Can. Med. Assoc. J. (Toronto) 92, 597-602, Mar. 20, 1965.

Signs of possible chronic intoxication due to insecticides were sought among 981 apple-growers. A group of 170 persons living in the same environment and 162 other persons having no contact with insecticides were used as controls. It was the first attempt to determine signs of chronic intoxication by organic phosphate and chlorinated hydrocarbon insecticides. The greater incidence of leukopenia and of neurologic manifestations found among the subjects suggest that insecticides may have some chronic effects in man. This assumption is reinforced by the similarities in the findings between the subjects and the environments, and by the parallelism between the duration of exposure to insecticides and the number of affected subjects. The repetition of this study at five-year intervals seems desirable until a sufficient number of apple-growers have been studied who have been exposed to large doses of insecticides for 10, 15 or 20 years. (Author abstract)**

01081

A. C. Allison and L. Nalluccl

UPTAKE OF HYDROCARBON CARCINOGENS BY LYSOSOMES. Nature (London) 203, (4949) 1075-7, Sept. 1964.

In vitro and in vivo experiments were undertaken to determine whether hydrocarbon carcinogens become associated with particular cytoplasmic constituents. Cell cultures from monkey kidney cells and calf serum were developed and then exposed to fine particles of hydrocarbon carcinogens. All cell types, after exposure, were found to contain brilliant fluorescing granules in the cytoplasm. No fluorescence was seen in background cytoplasm, mitochondria, or nuclei. It was concluded that the carcinogens were taken up by the cells and selectively concentrated in lysosomes. The authors discuss various hypotheses previously advanced including relation of hydrocarbon carcinogens to cell growth, cell metabolism, enzyme release, cytotoxicity, and mutagenesis. The hypothesis that lysosomes are involved in carcinogenesis might provide a simple explanation for co-carcinogenesis. However, results of these experiments provide no evidence for direct interaction of hydrocarbon carcinogens with genetic material. In opposition to the theory that these carcinogens initiate cancerous transformation through specific binding to key protein, the authors suggest that the primary target is the lysosomes and that secondary effects (due to released lysosomal enzymes and perhaps involving DNA and RNA) are perpetuated when the cells continue to divide.**

01206

E. L. Wynder and D. Hoffmann

SOME LABORATORY AND EPIDEMIOLOGICAL ASPECTS OF AIR POLLUTION CARCINOGENESIS. J. Air Pollution Control Assoc. 15(4) 155-9, Apr. 1965.

Chemical, analytical and biological studies were completed on the organic matter of large air pollution samples from Detroit. The high tumor response observed on mouse skin when the organic matter was applied in 12.5 per cent concentration can be partially explained by the presence of polynuclear aromatic hydrocarbons (PAH) as tumor initiators and certain acidic components as tumor promoters. Certain polaric neutral components of still unknown nature are indicated also to act as tumor promoters. The concentrations of PAH in various locations - Detroit and New York during different seasonal, meteorologic and traffic conditions are compared. The relative importance of carcinogenic air pollutants in man's environment is discussed in line with epidemiological evidence. (Author abstract)##

01146

J. R. McNerney and J. E. MacEwen

COMPARATIVE TOXICITY STUDIES AT REDUCED AND AMBIENT PRESSURES. I. ACUTE RESPONSE. Am. Ind. Hyg. Assoc. J., Vol. 26:560-573, Dec. 1965.

Comparison of the acute response to toxicants at ambient and reduced pressures (5 psia; 1008 GI) were made by exposing monkeys, dogs, rats, and mice for 3 weeks of continuous inhalation exposure to NO_2, GI and CCl_4. The experimental results show a definite reduction in the toxic response to the pulmonary irritants NO_2 and GI at reduced pressure when compared with ambient pressure exposures. With CCl_4, a systemic toxicant, no significant differences between the animals exposed at ambient or reduced pressure were observed. (Author abstract)##

01169

J.R. McCarroll, E.J. Cassell, W.T. Ingram, D. Walter

HEALTH AND THE URBAN ENVIRONMENT: HEALTH PROFILES VERSUS ENVIRONMENTAL POLLUTANTS. Am. J. Public Health, 56(2):266-275, Feb. 1966. (Presented at the 92nd Annual Meeting, Epidemiology Section, American Public Health Association, New York City, Oct. 7, 1964.)

A severe and continuing air pollution problem in New York City was demonstrated. The effects of this pollution on the health of the average city dweller are subtle and often masked by symptoms stemming from other causes. Nevertheless, careful analysis of variations in health of a sizable population followed forward in time may discriminate between these different etiologic factors. Subjecting such repetitive observations to the types of discriminating analysis being developed may permit identification of many unsuspected health effects of atmospheric pollution. (Author summary)##

01402

A. P. Altshuller, L. L. Klosterman, P. W. Leach, I. J. Hindawi, and J. E. Sigsby, Jr.

PRODUCTS AND BIOLOGICAL EFFECTS FROM IRRADIATION OF NITROGEN OXIDES WITH HYDROCARBONS OR ALDEHYDES UNDER DYNAMIC CONDITIONS. Intern. J. Air Water Pollution, Vol. 10:81-98, Feb. 1966.

Measurements have been made for chemical reactants and products, condensation nuclei and aerosol formation, eye irritation and plant damage when a wide variety of individual hydrocarbons or aldehydes or mixtures of hydrocarbons are irradiated with nitrogen oxides under dynamic conditions in a large chamber. Comparison of these results under flow conditions with static measurements also made in this study show that significant differences do occur in the chemical results obtained. Under dynamic chamber conditions, irradiated higher molecular weight paraffinic hydrocarbon-nitrogen oxide systems appear to be unreactive. The amounts of individual olefins consumed in irradiated multi-component olefin-nitrogen oxide mixtures are the same as in single component olefin-nitrogen oxide mixtures. When aromatic hydrocarbons also are included in the multi-component mixtures, interaction effects are observed. The results of the present study show that irradiated aromatic hydrocarbon nitrogen oxide mixtures not only undergo chemical reactions but also cause appreciable levels of eye irritation, plant damage and aerosol formation. It also has been shown that a representative higher molecular weight aliphatic aldehyde, propionaldehyde, when irradiated with nitrogen oxide will produce eye irritation, and moderate to heavy plant damage. The corresponding irradiated formaldehyde-nitrogen oxide mixtures did not cause damage to any of the plant varieties investigated. Using dynamic chamber conditions irradiated synthetic mixtures containing nitrogen oxides and the initial concentration levels of both olefins and aromatic hydrocarbons present in an irradiated automobile exhaust system will reasonably well reproduce the oxidant, aldehyde, eye irritation and plant damage levels measured in the irradiated automobile exhaust mixture. It is not possible to reproduce these results obtained for an irradiated automobile exhaust system, by irradiating nitrogen oxides and the initial olefin or aromatic hydrocarbon levels only. These results prove that aromatic hydrocarbons as well as olefins contribute a significant portion of the reactivity of irradiated automobile exhaust mixtures.##

01425

J. W. Clayton, Jr., D. B. Hood, M. S. Mick, and R. S. Wentz

INHALATION STUDIES ON CHLOROPENTAFLUOROETHANE. Am. Ind. Hyg. Assoc. J., Vol. 27:238-238, June 1966.

Dogs, rats, mice, and rabbits were exposed to an atmosphere of 10% chloropentafluoroethane for 90 exposures of six hours each. Body weight and clinical condition of rodents were unaffected. Rat and dog blood, urine analyses, and urinary fluoride analyses revealed no significant changes. Dog weight gain, temperature, respiration, and pulse were normal. Gross examination, histology,

and organ weights of all species revealed no effects attributable to chloropentafluoroethane. An industrial hygiene standard of 1000 ppm as an eight-hour time-weighted average is suggested. (Author abstract)##

01440

L. Miller, W. E. Smith, and S. W. Berliner

TESTS FOR EFFECT OF ASBESTOS ON BENZO(A) PYRENE CARCINOGENESIS IN THE RESPIRATORY TRACT. Ann. N.Y. Acad. Sci., Vol. 132:489-500, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

Rise of appearance and yields of papillomas and carcinomas in the respiratory tract of hamsters after intratracheal injections of benzo(a)pyrene are reported. Addition of the chrysotile variety of asbestos to the injections gave results consistent with an hypothesis that this material promoted benzo(a)pyrene carcinogenesis in the respiratory tract. Addition of the amosite variety of asbestos to injections of benzo(a)pyrene did not increase the yield of tumors found in the respiratory tract. The yield of tumors in the respiratory tract of hamsters treated with a limited series of intratracheal injections of benzo(a)pyrene decreased with time after discontinuation of exposure. This observation is of interest in relation to lung cancer risks in smokers who discontinue smoking. Further studies of histological material from these experiments are in progress.##

01461

G. S. Doyle, H. Rudow, and J. L. Jones

THE EFFECTS OF PHOTOCHEMICAL AEROSOLS ON EYE IRRITATION (FINAL REPT.). Stanford Research Inst., South Pasadena, Southern California Labs. June 1961.

An eye-irritation panel has been exposed to many steady-state reaction mixtures generated in a 530-cubic-foot irradiated stirred-flow reaction chamber. The reactants for one set of exposures were trace concentrations (usually 0.2 to 2.0 ppm by volume) of various hydrocarbons, predominantly olefins, and nitrogen dioxide in purified air. Reaction residence times ranged from one to two hours. Sulfur dioxide was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were then evaluated for relative eye-irritating ability with and without sulfur dioxide. In addition, the reactants and some of the reaction products, especially formaldehyde, were determined, and the light-scattering and particulate content of the mixtures were measured. Some of the conclusions drawn on the basis of the conditions of reaction and exposure used in this study are: (1) Aerosols derived from the photooxidation of sulfur dioxide and from sulfur dioxide itself probably have little, if any, effect on the eye-irritating ability of irradiated reaction mixture; (2) Trace concentrations of branched internal olefins, specifically

3-methyl-2-butene, and of a cyclic olefin, cyclohexene, can produce significant amounts of eye irritants other than formaldehyde and acrolein. (3) The use of dynamic (stirred-flow) conditions considerably enhances the sensitivity of subjects to the irritants; (4) Adding isobutane to a photooxidizing isobutylene-nitrogen dioxide mixture produced no significant effect; (5) The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants; and (6) Ethylene and propylene can produce significant eye irritation at realistic atmospheric concentrations. (Author summary modified)**

01469

F. Rutin

ENVIRONMENTAL CANCER. Am. Ind. Hyg. Assoc. J., Vol. 27:115-120, April 1966. Also published in Trans. Am. Governmental Ind. Hygienists Conf., 27th, Tex., 1965, 48-61.

The increasing sensitivity and specificity of biological test systems being used to identify carcinogenic agents emphasizes the need for correlation with human experience. The growing number of reports demonstrating a relationship between congential abnormalities and increased risk to the development of certain forms of cancer in childhood suggests the possibility of a common mechanism for their development. The role of environmental agents can be studied through the use of both experimental tetatogenic techniques. The possibility that chemical carcinogens may have their effect mediated through viral agents or in combination with viruses has been suggested by certain laboratory studies; this possibility is in need of investigation. (Author abstract)**

01508

R.O. Amdur

THE EFFECT OF HIGH FLOW-RESISTANCE ON THE RESPONSE OF GUINEA PIGS TO IRRITANTS. Am. Ind. Hyg. Assoc. J., Vol. 25:565-569, Dec. 1964.

Data on the increase in pulmonary flow-resistance produced in guinea pigs by exposure to irritants were examined to determine whether animals with higher initial control values showed a degree of response greater than the average. When the data for all irritants was pooled the increase was greater in the animals with high control resistances. When the irritant data was separated as to type (gas, aerosol or gas-plus-aerosol) the difference was not statistically significant for the gas alone but was significant for the other two groups. The differences were most marked when the exposures had been to low concentrations of irritant gas plus inert aerosol and in the two animals showing the highest initial resistance. (Author abstract)**

01591

J. L. Jones, M. Endow, F. A. Schuck, M. G. Caldwell, C.J. Doyle

A PROGRESS REPORT ON THE CHEMISTRY OF COMMUNITY AIR POLLUTION. Stanford Research Inst., South Pasadena, Southern California Labs. Jan. 5, 1962. 59 pp.

Then mixtures of propylene and nitrogen dioxide in concentrations of 0.1 to 1.0 part per million (ppm) were photochemically reacted by irradiation with near ultraviolet light, the reaction products were irritating to the eyes of human test subjects. The intensity of the ultraviolet light used in these laboratory experiments was comparable to 7:00 to 8:00 a.m. fall sunlight. Preliminary additional work on ethylene reaction mixtures, which were irradiated with near ultraviolet light corresponding to 12:00 noon summer sunlight intensity, definitely produced eye irritating reaction product mixtures. The evidence from infrared spectra of precipitated model aerosols formed by the photooxidation of lower olefin homologs - nitrogen oxides - sulfur dioxide mixtures at 50% relative humidity indicated that the principal constituent of the aerosol was sulfuric acid. A study of the dark reaction of ozone with olefins has been initiated. Preliminary experimental results indicate that a kinetic reaction mechanism based on a simple bimolecular reaction between ozone and an olefin cannot account for the experimental results obtained to date. Some theoretical quantum mechanical calculations have been made that satisfactorily account for some of the experimental rate constants in the literature. (Author summary modified)##

01598

M.A. Rensetti F.A. Schuck

PRELIMINARY OBSERVATIONS ON THE RELATIONSHIP BETWEEN EYE IRRITATION IN SYNTHETIC SYSTEMS AND IN THE ATMOSPHERE. Stanford Research Inst., South Pasadena, Southern California Labs. 1960. 17 pp. Also published in J. Air Pollution Control Assoc. 11, (3) 137-8, Mar. 1961.

The eye irritation values found in Los Angeles smog were tentatively related to the values found in laboratory mixtures. In the synthetic systems, the major irritants appear to be formaldehyde, acrolein, and, possibly, Compound X. Because of the insufficient and inconclusive nature of the data obtained from atmospheric sampling, a definitive statement cannot be made on this matter. (Author summary modified)##

01601

F.A. Schuck, G.J. Doyle, M. Endow

A PROGRESS REPORT ON THE PHOTOCHEMISTRY OF POLLUTED ATMOSPHERES. Stanford Research Inst., South Pasadena, Southern California Labs. Dec. 1960. 133 pp

During the photooxidation of olefins, three reactions appear important: the reaction of olefins with oxygen atoms, with ozone, and with active intermediates. The active intermediates may be free radicals or zwitterions. The rate of disappearance of olefin, over and above that accountable by reaction with oxygen atoms and ozone, has been termed the "excess rate." The importance of active intermediates in the mechanism of olefin photooxidation is suggested by these observations: 1. Some products cannot be accounted for by simple rupture of the double bond. 2. The excess rate is proportional to the square root of the light intensity and to the square root of the initial nitrogen dioxide concentration. The major products of the photooxidation are produced by rupture of the double bond, leading to various carbonyl compounds. However, significant amounts of formaldehyde and acetaldehyde are formed from olefins in certain cases in which these compounds could not be formed by simple bond rupture. Secondary photooxidation of the initial products can also contribute to the products. Alkyl nitrites were identified among the minor products of olefin photooxidation. These nitrites are probably contributing to olefin oxidation since, as was shown previously, alkyl nitrites promote destruction of olefins as well as does nitric oxide or nitrogen dioxide. Hedius to severe eye irritation was obtained with photooxidation of mixtures containing 0.5 ppm each of certain olefins and nitrogen dioxide. These concentrations are comparable to those existing in the Los Angeles atmosphere. The amount of eye irritation caused by photooxidation of auto exhaust probably may be reduced most efficiently by control of olefins rather than by control of oxides of nitrogen. This statement is based on studies of olefin mixtures of the type found in auto exhaust; these studies show that, under certain circumstances, reduction of the oxides of nitrogen can lead to an increase rather than a decrease in eye irritation. (Author summary)GG

016/9

F. A. Vingiello, S. G. Guo, P. Paine, and P. Hanson

9-THIENYLANTHRACENES. J. Med. Chem. 7, pp. 812, 1964.

Author discusses the thienylanthracenes which were prepared as a part of an air pollution study program to make new polycyclic aromatic compounds available for carcinogenicity testing. Methods of preparation are given.GG

016/6

F. A. Vingiello and I. Ojakaar

NEW POLYNUCLEAR AROMATIC COMPOUNDS SHOWING CARCINOGENIC ACTIVITY. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-66.)

Four new polynuclear aromatic hydrocarbons containing seven fused

rings have been prepared: naphtho (1,2-a)perylene, naphtho(2,1-)benzo(a)pyrene, naphtho (1,2-)benzo(a)pyrene, and naphtho (2,3-) benzo(a)pyrene. These are closely related structurally to naphtho(2,1-a)perylene which was recently prepared and which was found to be strongly carcinogenic. The structures of the new hydrocarbons were established by elemental analyses, and by ultraviolet, visible and infrared absorption spectral studies. Further, the principles of annelation and the formation of THF molecular compounds are consistent with the assigned structures. An analytical procedure based on high-temperature gas chromatography has been established. A new polynuclear aromatic hydrocarbon containing eight fused rings, naphtho(1,7,8-efg)anthanthrene 6, has been prepared and identified. The new hydrocarbons have been submitted for carcinogenic activity studies. (Author summary)##

01660

E. DeMaeyer J. DeMaeyer-Guignard

EFFECTS OF POLYCYCLIC AROMATIC CARCINOGENS ON VIRAL REPLICATION: SIMILARITY TO ACTINOMYCIN D. Science 146, 650-1, Oct. 30, 1964

When incorporated into a nutrient overlay, the carcinogenic hydrocarbons benzo(a)pyrene and 7,12-dimethylbenz(a)anthracene inhibit plaque formation by herpes virus and vaccinia virus, DNA viruses, but not by Sindbis virus, an RNA virus. These carcinogens also decrease herpes and vaccinia virus yields in liquid medium, without affecting Sindbis virus yields. Four structurally related, but noncarcinogenic polycyclic hydrocarbons, namely benzo(i)pyrene, pyrene, benz(a)anthracene and anthracene, have no inhibitory effect on RNA virus replication. Taken together with the known inhibition of interferon production, these effects on virus growth resemble the action of actinomycin D and hence provide evidence for a selective interaction of these carcinogens with DNA. (Author abstract)##

01692

J.H. Weisburger E.K. Weisburger

CHEMICALS AS CAUSES OF CANCER. Chem. Eng. News 44, (6) 129-42, Feb. 7, 1966.

Cancer research falls into two broad groupings-diagnosis and treatment, and etiology and prevention. Diagnosis and treatment relate to the methods leading to the discovery of a cancer already present, so that appropriate remedial measures can be used. Etiology and prevention deal with attempts to discover the causes and origins of neoplastic diseases, to understand the mechanisms of their formation, and to delve into their inherent nature. The underlying idea for research on the etiology and prevention of cancer is that the disease can be prevented by modifying its course or by eliminating causative or accelerating

factors. This report covers a portion of cancer research pertaining to etiology and prevention. In particular, the article discusses cancer induction by aromatic amines, azo dyes, nitrosamines, and mycotoxins.##

01742

M. L. Mathews, L. Friberg, B. Holma, and A. Rajland

A DI-DISPERSE OCTADECANOL AEROSOL WITH NUCLEI OF AU(198) AND SC(46) RESPECTIVELY. Proc. Intern. Congr. Occupational Health, 14th. pp. 532-5. (Congress held in Madrid, Spain, Sept. 1963.)

The knowledge that particle size is of importance for lung-clearance has led to the development of monodisperse test aerosols. The experiments achieved have shown that it is possible to produce monodisperse radioactive aerosols in the range of 1-10 microns. This range has been considered to be of particular importance for studying the clearance of the ciliated respiratory tract of animals. By exposing animals to di-disperse aerosols, where the two particle sizes are tagged with different isotopes, it is possible to study at the same time clearance of two sizes, which are differently deposited and which also may have different clearance rates.##

01762

W. W. Payne

OCCUPATIONAL FACTORS IN CARCINOGENESIS. Public Health Repts. (U.S.) 81, (9) 777-81, Sept. 1966.

The author reviews the history of the occurrence of cancer in various occupational groups resulting from exposure to specific carcinogens. Examples are the occurrence of scrotal cancer in workers exposed to polycyclic aromatic hydrocarbons, bladder cancer in dye workers exposed to aromatic amines, and bronchogenic cancer in workers employed in the chromium industry. Other inorganic carcinogens are cited, among them arsenic, nickel, and asbestos dust. The importance of studying occupational exposures to possible carcinogens is emphasized.##

01796

V. Pirila, L. Korpi, A. Laamanen

AIR POLLUTION AND ALLERGY. Acta Allergol. (Copenhagen) 18, 113-30, 1963

After describing some examples of acute air pollution episodes, the authors give a brief review of natural air pollution from the allergological point of view. Cultural air pollution is considered under two headings: indoor or local, and outdoor or general. The capacity of some chemical present in outdoor air-SO2, H2S, NH3, Be and F-to provoke allergic diseases is discussed on the basis of the literature and personal investigations. Finally some figures and examples are given regarding the quality and degree of air pollution in the USA and in Finland. The authors stress the difficulty which arises in fixing the maximum allowable concentrations for general air pollution, owing to the wide variations in physiological response in general and in allergic reactivity in particular. (Author summary modified)##

01805

A. Kajland, N.G. Ericson, L. Friberg, B. Holma

RADIOACTIVE MONODISPERSE TEST AEROSOLS AND LUNG CLEARANCE STUDIES. Health Phys. 10, 241-5, 1964.

Data are given from investigations into the production of radioactive test aerosols and studies of lung clearance in the rabbit. Lung clearance was measured using a specially developed profile scanning technique. This technique made it possible to follow the clearance rate from repeated measurements of the lung activity in a single animal. Furthermore, the animal could be re-exposed. Heterodisperse radioactive aerosols were used initially; more recently, monodisperse aerosols have been used. Monodisperse radioactive aerosols in the particle range 1-10 micron have hitherto been produced mainly by a modified LaMer method for lung clearance studies. Monodisperse radioactively tagged plastic aerosols have also been produced by the spinning disk technique, and methods for incinating (with 131 I) latex particles are in progress. (Author abstract)##

01806

P. Kotin J.L. Falk

ATMOSPHERIC FACTORS IN PATHOGENESIS OF LUNG CANCER. Advan. Cancer Res. 7, 475-514, 1963.

In this review of the atmospheric factors in the pathogenesis of lung cancer, the subject is considered under the major headings of: general epidemiological considerations, experimental considerations; biopsy studies, clinical lung cancer; and etiology of lung cancer. There is a bibliography of 194 references.##

01813

E.L. Wynder E.C. Hammond

A STUDY OF AIR POLLUTION CARCINOGENESIS. I. ANALYSIS OF EPIDEMIOLOGICAL EVIDENCE. Cancer 15, (1) 79-2, Feb. 1962.

The evidence indicating that general air pollution increases the risk of developing lung cancer is reviewed. In general, the rates for an urban area are less than twofold greater than those for the rural areas. This increased risk seems to apply mainly to smokers, but this is not certain, due to the scarcity of data on nonsmokers who die of lung cancer. The urban factor may not be due to general air pollution but could be a result of other variables, including the better reporting of lung cancer in cities, the moving to cities of lung cancer patients prior to death, the difference in smoking habits and patterns between residents of urban and rural areas, or occupational differences in the 2 areas. Above all, the influence of industrial exposures has not been adequately taken into consideration in any of the studies that have investigated the relationship of air pollution to cancer of the lung. Some cities, because of particular geographical or industrial situations, may have special problems. This study has reviewed data in respect to general air pollutants in ordinary city living. In this sense we have excluded the kind of air pollutants to which a worker is exposed in a specific occupational environment, which must be regarded as occupational and industrial exposures, some of which are clearly related to an increased risk of lung cancer.##

01884

P. Rotin

AIR POLLUTION WITH CANCEROGENIC SUBSTANCES. Acta, Unio Intern. Contra Cancrum 19, (3-4) 469-71, 1963.

Polluted urban air must seriously be regarded as one of the factors responsible for the increased incidence of lung cancer. Carcinogenic agents have been identified in polluted urban air, and extracts have resulted in the induction of malignant tumors following skin painting or subcutaneous injection in inbred strains of mice. Further, aerosols of vaporized gasoline, in conjunction with multiple influenza infections, have resulted in the induction of human type squamous cell carcinomas in C57 black mice following inhalation exposure. Evaluation of the carcinogenic potential of polluted urban air requires an assessment of the role of (a) respiratory tract irritants, (b) the physical aspects of particulates in relation to deposition in the tracheobronchial tree, and (c) chemical compounds potentially acting as anti-carcinogenic agents. (Author summary)##

01916

V. A. Riazanov.

CRITERIA AND METHODS FOR ESTABLISHING MAXIMUM PERMISSIBLE CONCENTRATIONS OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 32, 389-98, 1965.

Experience in the USSR in establishing standards for air pollution control is described. It is emphasized that health considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

01966

H. L. Falk, P. Kotin, and A. Mehler

POLYCYCLIC HYDROCARBONS AS CARCINOGENS FOR MAN. Arch. Environ. Health 8, 721-30, May 1964.

The preponderance of evidence would support the conclusion that certain polycyclic aromatic hydrocarbons are carcinogenic to man just as they are to experimental species. The carcinogenicity is dependent upon numerous polycyclic aromatic hydrocarbons. While benzo(a)pyrene is perhaps the most ubiquitous and potent of all four- or five-ring polycyclic aromatic hydrocarbons found in nature, others may still possess carcinogenic potency. The cancers most easily produced with these agents in experimental species are squamous cell carcinomas of the skin and, similarly, the most frequent cancer observed in man in association with occupational exposure is skin cancer. The difficulty in induction of pulmonary cancer with polycyclic aromatic hydrocarbons in experimental species may well reflect the low incidence of occupational lung cancer. In both instances effective physiologic defenses are at work to prevent the initiation of carcinogenic processes.##

01971

H. V. Warren

REGIONAL GEOLOGY AND GEOGRAPHY. Science 166, (3909) 718-9, Apr. 25, 1969.

The increasing evidence of the importance of trace elements in the earth's crust to healthy living tissue in both animals and plants was emphasized by a panel of an interdisciplinary symposium of "Medical Geology and Geography", held in Montreal, 28 Dec 1964. The themes of the four panel members, a chemical biologist, a professor of pharmacognosy, a geologist, and a general medical practioner, are summarized. It is believed that some of the trace metals that find their way into soils and foods may play the part, directly or indirectly, of carcinogens, as in the case where certain chelates are formed. The complexities of the subject, such as variations in geographical distribution of the elements and the intricacies of certain biological processes, are discussed.##

01987

R. G. Rinnere

ENGINEERING THE CHRONIC EXPOSURE OF ANIMALS TO LABORATORY PRODUCED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 12, 527-30, Nov. 1962. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A laboratory facility designed for studies to determine the effects of lifetime exposure of experimental animals to auto emissions is described. The emissions produced simulated atmospheric concentrations and conditions generally found in the air of a city like Los Angeles.##

01988

D. Hofreuter

THE AUTOMOTIVE EXHAUST PROBLEM (IT'S RELATION TO HEALTH). Arch. Environ. Health 2, 559-63, May 1961

The problem of how automotive exhaust products may affect the public health is examined by considering the following 6 broad areas: the chemical composition of automobile exhaust; some past investigations; the possible irritating qualities of automotive exhaust gases; the possible relationship of lung cancer to products of automobile exhaust; certain specific substances of vehicular exhaust, namely, CO and lead, and their possible effects on the public health, and, finally, a few of the current medical projects that are under investigation by the Division of Air Pollution.##

01992

P. V. V. Nagili

ATMOSPHERIC POLLUTION, THE PROBLEM - AN OVER-ALL VIEW.

Arch. Environ. Health 10 241-7, Sept. 1965. (Presented at the 12th Annual Meeting, American Academy of Occupational Medicine, Williamsburg, Va., Feb. 12, 1960.)

Some epidemiological and laboratory studies are reviewed. Statistical evidence suggests a relationship between air pollution levels and mortality rates from lung cancer notwithstanding smoking habits. Health statistics regarding air pollution episodes in the United States and Europe are given.##

02173

A. S. Josephson.

IMMUNOLOGIC METHODS IN AIR POLLUTION RESEARCH. Arch. Environ. Health 8, 183-6, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Author discusses the use of immunologic techniques, both direct and indirect, to investigate the possible effects of air pollution such as alteration of proteins and sensitivity reactions to pollutants. Immunology also provides an approach to study the body defense mechanisms to pollutants.##

02223

S.D. Murphy, C.E. Ulrich, U.K. Lang

ALTERED FUNCTION IN ANIMALS INHALING CONJUGATED NITRO-OLEFINS. Toxicol. Appl. Pharmacol. 5, (3) 319-30, May 1963. (Presented in part at the Third Inter-American Conference on Occupational Medicine and Toxicology, Miami, Fla., Aug. 1961.)

Increased total pulmonary flow resistance and tidal volumes and decreased respiratory rates of guinea pigs and decreased voluntary activity of mice occurred during inhalation of the vapors of conjugated nitro-olefins at concentrations near or below the threshold for human, sensory detection. Increasing concentrations increased the magnitude of the effects. Comparison of the effects of 2-nitro-2-butene, 3-nitro-3-hexene, and 5-nitro-5-nonene indicated that the effectiveness on pulmonary function was inversely related to the carbon chain length. However, 5-nitro-5- nonene was slightly more active than the butene and hexene in producing depression of mouse activity. At the low concentrations tested, the effects of nitro-olefins were reversible when the animals were returned to clean air. Injection of atropine sulfate overcame the increased pulmonary flow resistance induced by 5-nitro-5-nonene. The response of animals to inhaled nitro-olefins qualitatively resembles effects which have been observed when animals inhale high concentrations of irradiated automobile exhaust. These effects are, however, relatively nonspecific and are produced by several other irritating vapors and gases which have been shown to be present in measurable quantities in exhaust mixtures. (Author summary)##

The increasing evidence of the importance of trace elements in the earth's crust to healthy living tissue in both animals and plants was emphasized by a panel of an interdisciplinary symposium of "Medical Geology and Geography", held in Montreal, 30 Dec 1964. The theses of the four panel members, a chemical biologist, a professor of pharmacognosy, a geologist, and a general medical practioner, are summarized. It is believed that some of the trace metals that find their way into soils and foods may play the part, directly or indirectly, of carcinogens, as in the case where certain chelates are formed. The complexities of the subject, such as variations in geographical distribution of the elements and the intricacies of certain biological processes, are discussed.##

01987

B. G. Hinners

ENGINEERING THE CHRONIC EXPOSURE OF ANIMALS TO LABORATORY PRODUCED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 12, 527-30, Nov. 1962. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A laboratory facility designed for studies to determine the effects of lifetime exposure of experimental animals to auto emissions is described. The emissions produced simulated atmospheric concentrations and conditions generally found in the air of a city like Los Angeles.##

01988

D. Hofreuter

THE AUTOMOTIVE EXHAUST PROBLEM (ITS RELATION TO HEALTH). Arch. Environ. Health 2, 559-63, May 1961

The problem of how automotive exhaust products may affect the public health is examined by considering the following 6 broad areas: the chemical composition of automobile exhaust; some past investigations; the possible irritating qualities of automotive exhaust gases; the possible relationship of lung cancer to products of automobile exhaust; certain specific substances of vehicular exhaust, namely, CO and lead, and their possible effects on the public health, and, finally, a few of the current medical projects that are under investigation by the Division of Air Pollution.##

01992

P. V. V. Hamill

ATMOSPHERIC POLLUTION, THE PROBLEM - AN OVER-ALL VIEW.

02276

M.N. Siegert

CANCERS IN MICE FROM ASPHALT FRACTIONS. Ind. Med. Surg. 34, 573-7, July 1965.

Steam-refined asphalt was separated into four fractions; asphaltenes, aromatics, saturates, and resins. The method of separation is given. The aromatics and saturates fractions showed essentially all the ultraviolet light fluorescence of the 4 fractions. These two fractions were pooled and tested for oncogenesis by painting on the skin of C57 black mice. Thirty-two percent of the mice thus treated and coming to autopsy developed cancers. This result is compared to previous experiments testing the cancer producing properties of pooled air and steam refined asphalt, and each tested separately. (Author summary)**

02277

W.E. Swann, Jr O.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. IV. EFFECTS OF ACUTE SMOG EPISODES ON RESPIRATION OF GUINEA PIGS. Arch Environ. Health 12, 699-704, June 1966 (Presented at the 29th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa. Apr. 30, 1964.)

Measurement of total expiratory flow resistances were made on guinea pigs on days of unusual conditions of weather and smog. When these resistances were compared with routine monthly measurements on the same animals, significant increases in resistance were found at oxidant levels of approximately 0.10 ppm or more. Also, significant increases in resistance were observed when approximately 40% of alert levels of the oxides of nitrogen, carbon monoxide, and hydrocarbons were present. Only when high temperature was accompanied by approximately 0.10 ppm oxidant did a significant increase in resistance occur. During a smog episode when alert levels of oxidant and 25% of alert levels of carbon monoxide and hydrocarbon were recorded on two successive days, older guinea pigs breathing ambient air had highly significant increases in resistance. Alert smog levels apparently act as a respiratory stress which was more obvious in the older animals. Some animals had little or no response to the smog while some animals greatly responded and had quick recovery; other animals greatly responded to the smog and had a slow recovery or no recovery and died. This suggests a possible individual difference in sensitivity to smog among animals of the same species. The pathological findings on the two animals that died during the episode indicated severe pulmonary abnormality. Also, some animals that died within 45 days following the episode and had high resistances during the episode also had pathological pulmonary changes. However, others that had high resistances and died had no such alterations. Although high smog levels produced a significant increase in pulmonary resistance, this response may or may not be related to the degree of impairment.**

02208

W.C. Hueper

ENVIRONMENTAL AND OCCUPATIONAL CANCER HAZARDS. PART I OF SYMPOSIUM: CHEMICAL CARCINOGENESIS. Clin. Pharmacol. Therap. 3, (6) 776-813, Dec. 1962

The growth of an environmental carcinogenic spectrum composed of recognized, suspected, and potential human carcinogens of chemical, physical, and parasitic nature should provide an impressive warning to all concerned with the maintenance and protection of the health and well-being of mankind to exert all possible effort to develop methods and facilities by which sources of production, channels of dissemination, routes of exposure, prospective and actual target organs and tissues, and number and types of individuals exposed to natural and man-made carcinogens can be more readily and reliably identified. It is essential that, where possible, human contact with environmental carcinogens be totally eliminated or, whenever such a stringent measure appears impractical or impossible, reduced to a minimum with respect to degree, frequency, duration, and number of persons exposed. While the presently available methods of identifying carcinogenic agents are admittedly slow and not totally adequate, experimental observations and their implications in man demand that first and dominant consideration be given to the protection of the community against actual or potential cancer hazards. In such a decision, the health and life of the general public should receive the benefit of doubt without any reservation. (Author summary modified)##

02332

T. B. Lewis, F. G. Hunter, and E. A. Busch.

EFFECTS OF ATMOSPHERES CONTAMINATED WITH IRRADIATED AUTOMOBILE EXHAUST ON REPRODUCTION OF MICE. Preprint, 1966.

The exposure of mice to irradiated automobile exhaust prior to mating significantly impaired reproductive function in male members of sexual pairs. The impairment was expressed at various stages of reproduction: conception, fecundity, and infant survival. These effects imply that the chromatin content of the sperm was altered. This experiment suggests mutational effects on mammalian cells from components or subsequent products of irradiated automobile exhaust. Significantly, the concentrations of these pollutants were similar to those present in many urban communities today. A direct toxic effect on infant mice was noted during postnatal exposure to irradiated automobile exhaust. Death rates during the first 8 days of life were higher compared to those for controls. (Authors' summary)##

02357

B.G. Bisi

AIR POLLUTION AND YOUR LUNGS. Preprint. (Presented at

the Symposium on Respiratory Diseases, Syracuse, N.Y., May 14, 1965.)

The adverse effects of man-made air pollutants on man's health, with particular reference to respiratory diseases, are discussed generally in this paper.##

02551

A.A. Minaev

DETERMINATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF ALPHA-METHYLSTYRENE VAPOR IN THE ATMOSPHERE. (Issledovaniya po gigienicheskomu normirovaniyu par ov alpha-metilstirola v atmosfernom vozdukhe.) Hyg. Sanit. 31, (2) 157-61, Feb. 1966.
CFSTI: TT66-51160/1-3

Alpha-Methylstyrene vapor in a concentration of 0.04 mg/cubic meter does not give rise to any subjective sensations or reflex-sensory responses in man. In white rats which were continuously exposed to the same vapor, in a concentration of 5 mg/cubic meter over a period of 3 months, some depression of function of the central nervous system, as well as disturbances in the biochemical reactions resulted. An increased number of fluorescent leucocytes showed color changes and there were histopathological changes in the lungs, the central nervous system and the parenchylstyrene organs. Under the same conditions, poisoning with an alpha-methylstyrene concentration of 0.5 mg/cubic meter only caused a rise in the number of leucocytes showing normal fluorescent reactions, as well as some slight histopathological changes in the lungs and liver of a few of the animals. It is therefore recommended that the mean daily maximum permissible concentration of alpha-methylstyrene vapor in the air be 0.05 mg/cubic meter (the maximum one-time dose) because this concentration does not produce a toxic effect upon prolonged exposure. The synthetic rubber factory investigated polluted the air with alpha-methylstyrene vapor up to a distance of 5000 m from the factory, at which point the maximum one-time concentration of the vapor was found to be 0.04 mg/cubic meter.##

02566

G.I. Solomin

EXPERIMENTAL DATA ON THE HYGIENIC SUBSTANTIATION OF THE SINGLE PERMISSIBLE CONCENTRATIONS OF ISOPROPYLBENZENE AND ISOPROPYL-BENZENE HYDROPEROXIDE IN ATMOSPHERIC AIR. (Eksperimental'nye dannye k gigienicheskomu obosnovaniyu maksimal'nykh raovykh predel'no dopustimykh kontsentratsii izopropilbenzola i gidroperekisi izopropilbenzola v atmosfernom vozdukhe.) Hyg. Sanit. 29, (2) 1-8, Feb. 1964.
CFSTI: TT65-50023/2

Concentrations of isopropylbenzene equal to 0.06 mg per cu m when present alone and 0.36 mg per cu m in a mixture with isopropylbenzene hydroperoxide are the olfactory thresholds.

Concentrations of HPIPB equal to 0.01 mg per cu m when present alone and to 0.017 mg per cu m in a mixture with IPB are the olfactory thresholds. For IPB the threshold for a reflex effect on the sensitivity of the eyes to light is 0.07 mg per cu m; when present in a mixture with HPIPB 0.05 mg per cu m. The threshold of the reflex effect on the sensitivity of the eye to the light in the case of HPIPB is 0.02 mg per cu m when alone and 0.01 mg per cu m when mixed with IPB. The threshold of the reflex effect on cerebral electrical activity for IPB is 0.028 mg per cu m; when mixed with HPIPB, 0.014 mg per cu m. For HPIPB the threshold of the reflex effect on electrical cerebral activity is 0.012 mg per cu m; when mixed with IPB, 0.007 mg per cu m. The following maximum single permissible concentrations are suggested: for IPB, 0.014 mg per cu m; for IPB in the presence of HPIPB, 0.007 mg per cu m; for HPIPB 0.007 mg per cu m, for HPIPB in the presence of IPB, 0.003 mg per cu m, that is, half as much.##

02568

R.V. Grigor'eva

STUDIES ON POLLUTION OF ATMOSPHERIC AIR WITH MALEIC ANHYDRIDE. (K voprosu o zagryaznenii atmosfernogo vozdukha maleinovym angidridom.) Hyg. Sanit. 29, (3) 7-11, Mar. 1964.
CFSTI: TT65-50023/3

The investigations were carried out in the vicinity of phthalic anhydride production plant, where the wastes discharged in the air contained maleic anhydride. This compound was detected in the air at a distance of 500 m from the site of discharge in concentrations of 0.0 to 3.1 mg/cu m and within a radius of 1 km in concentrations of 0.0 to 2.6 mg/cu m. The work is being continued to obtain hygienic backgrounds for determining the maximum permissible concentration of maleic anhydride in the atmospheric air. Its olfactory threshold value and that for producing an irritating effect on the mucous membranes of eyes and respiratory tract have already been determined. For most sensitive persons they lie between 1.1 mg/cu m and 1.0 mg/cu m maleic anhydride respectively. (Author abstract)##

02571

M.M. Gotovskii

TOXICOLOGY OF GUAIACOL VAPORS AND RESINS. (K toksikologii parov gvayakola i ego smoly.) Hyg. Sanit. 29, (3) 105-8, Mar. 1964.

On the basis of experimental findings on the toxicity of guaiacol vapors, a calculation of an approximate value was made for the permissible concentration of these vapors. On the basis of the LC(sub)50 (7.57 mg/l), it was found equal to 0.02 mg/l.

In the study of the effect of guiacol resin on the skin it was determined that it possesses neither an irritating nor a blastomogenic effect.##

02588

N. G. Andreeshcheva

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF NITROBENZENE IN ATMOSPHERIC AIR. (Obosnovanie predel'no dopustimoikontsentratsii nitrobenzola v atmosfernom vozdukhe.) Hyg. Sanit. 29, (8) 4-9, Aug. 1964.
CFSTI: TT65-50021/8

The effect produced by low concentrations of nitrobenzol on man and animals was studied to substantiate the maximum permissible concentration of this compound in the atmospheric air. It was found in the study of the reflex action to nitrobenzol that in most sensitive persons the threshold value of the olfactory preception amounted to 0.0182 mg/cubic meter, and that of the eye light sensitivity to 0.0157 mg/m. The cerebral electric activity was affected by a concentration of 0.0129 mg/cubic meter. Nitrobenzol at a concentration of 0.008 was not detected by smelling and produced no changes in cerebral potentials; this concentration is suggested as the singular maximum permissible concentration. A continuous round-the-clock action of nitrobenzol vapours or a period of 72 days at a concentration of 0.08 mg/cubic meter produced in the experimental animals changes in the motor chronaxy of muscle-antagonists, and in the cholinesterase activity of the whole blood; it also brought about methemoglobinemia, sulfhemoglobinemia, and a fall in the total content of hemoglobin oxyhemoglobin. Under conditions of continuous action (after the same procedure) of nitrobenzol at a concentration of 0.008 mg/cubic meter the animals' organism showed to be indifferent to it. This amount is suggested as the maximum permissible concentration of nitrobenzol in the atmospheric air. (Author abstract)##

02596

A. P. Il'nitskii and S. N. Varshavskaya

WATER AS A FACTOR IN SPREADING CARCINOGENS IN THE ENVIRONMENT. (Voda kak odin iz faktorov rasprostraneniya kantserogennykh veshchestv vo vneshnei srede.) Hyg. Sanit. 29, (9) 88-96, Sept. 1964.
CFSTI: TT65-50021/9

Authors review the carcinogenic agent, 3,4 benzpyrene, and suggest that reduction of it in the air is essential to prevention of cancer. Although author recognizes the presence of 3,4 benzpyrene in the atmosphere he emphasizes its presence in oceans and rivers (in general water). The use of detergents (and their subsequent dumping in the rivers) complicates the detection of 3,4 benzpyrene because it becomes an emulsion and the public is potentially more damaged.##

02605

A. A. Dobrinskii

ESTABLISHING HYGIENIC NORMS FOR SOME INTERMEDIATES IN CAPROLACTAM PRODUCTION IN THE AIR. (O gigienicheskom

normirovanii nekotorykh promyshlennykh yadov/kheptyl proizvodstva kaprolaktama v atmosfernom vozdukhe.) Hyg. Sanit. 29, (12) 7-12, Dec. 1964.
CFSTI: TT 65-50023/12

In order to substantiate the maximal permissible single concentrations of cyclohexanone and cyclohexanol, the author determined their threshold values of smell, changes of the ocular light sensitivity after inhalation of small concentration of cyclohexanone, the threshold values of their action on the electric cerebral activity by the method of obtaining electrocortical conditioned reflexes and by the method of augmenting the cerebral potentials. For substantiating the average daily maximal permissible concentrations, round-the-clock chronic poisoning of albino rats with vapors of cyclohexanone and cyclohexanol was carried out for a period of 87 days. The animals' general condition and weight, the chronaxy correlation of muscle-antagonists, the kinetics of the cholinesterase activity, the content of the sulfhydryl group proteins in the blood serum and content in the brain and the liver were studied. The author suggests the maximal single and daily average permissible concentrations in the atmospheric air of cyclohexanone to comprise 0.08 mg/cu m and that of cyclohexanone - 0.06 mg/cu m (Author abstract)##

02689

V. Butscher, H. Zwingman, H. Pichaushan

DUR ABSORPTION AND EXTRACTION OF 3,4-BENZPYRENE WITH SPECIFIC TYPES OF SOOT. Staub (English Translation) 26, (3) 5-11, Mar. 1966.
CFSTI: TT66-51159/3

Investigations into the absorption capacity have been carried out of 3,4-benzpyrene in benzole (benzene) solution of two types of soot, differing in their properties and average particle size. In the case of very low benzpyrene concentrations a complete absorption was not achieved. It has been found during extraction of soot charged with benzpyrene by means of benzole (benzene) that benzpyrene can be separated from the soot if the extraction is carried out intensively and for a sufficiently long time. (Author summary)##

03543

R. W. Barth

EFFECTS OF THE RATIO OF HYDROCARBONS TO OXIDES OF NITROGEN IN IRRADIATED AUTO EXHAUST. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, 64 pp., Oct. 1966
HSM 999-AP-30

As a part of a series of investigations of the problem of vehicle exhaust as an air pollutant, photochemical reactions are being studied in detail by the use of large dynamic irradiation chambers. In these studies exhaust, generated by test vehicles on a dynamometer, is diluted with air and irradiated to simulate the

effects of sunlight under sizing conditions similar to those in the atmosphere. The irradiated mixture is used to study chemical reactions and to evaluate plant damage and human eye irritation. In this second series of irradiation tests performed by the Public Health Service, the ratio of total hydrocarbon (HC) to oxides of nitrogen (NOx) was varied between 1-1/2 and 24. Hydrocarbon concentrations were varied from 3 ppm to 12 ppm total carbon; oxides of nitrogen concentrations were varied from 1/4 ppm to 2 ppm. Greatest plant damage occurred when both the HC/NOx ratios and hydrocarbon concentrations were high. The levels of eye irritation were highest at the higher chamber hydrocarbon concentrations. For a given hydrocarbon level, chemical reaction rates were highest at the high HC/NOx ratios. (Author abstract) ##

02967

H. Petri

ASSESSING THE HEALTH HAZARDS OF GASEOUS AIR POLLUTIONS. Staub (English Transl.) 25, (10) 50-7, Oct. 1965.
CFSTI: TT 66-51040/10

Many gases and vapours in molecular dispersion have pathophysiologic effects, that is, effects dangerous to health. Various substances can be detected by smell even if present in air in small quantities, and at a certain concentration they may become a nuisance; these substances are, for instance, mercaptans, butyric acid, acrolein and amines, such as trimethylamine; hydrogen sulphide, carbon disulphide, pyridine, etc. cause nuisance at slightly higher concentrations. Sulphur oxides, hydrogen fluoride and other acid aerosols, further, ozone, chlorine, bromine and nitrous gases are dangerous to health, because they irritate body tissue. As a result of the increase in road traffic the odourless carbon monoxide has become very important. The biological assessment of gas or vapour emission with regard to their effect on man, and special effects of these substances are discussed in detail. (Author summary) ##

01076

S.D. Murphy, J.E. Long, C.E. Ulrich, H.V. Davis

EFFECTS ON ANIMALS OF EXPOSURE TO AUTO EXHAUST. Arch. Environ. Health 7, 60-70, July 1963 (Presented at Air Pollution Research Conference, Los Angeles, Calif., Dec. 6-7, 1961.)

The effects on experimental animals of brief exposure (2-6 hrs.) to exhaust polluted atmospheres were studied. The concentrations of exhaust gases in the experimental atmospheres were varied between levels which approximated polluted ambient atmospheres and concentrations several times greater than present community pollution levels. Changes in physiological function of experimental animals, which could be objectively measured, were produced during exposure to these polluted atmospheres. Analyses presented are for comparative purposes.

Comparison of concentrations in irradiated and nonirradiated atmospheres of approx. equal dilution ratios shows the photochemical formation of aldehydes, nitrogen dioxide, and total oxidant at the expense of nitric oxide and olefin. Measurements of pulmonary function, spontaneous activity, and mortality of impaired animals were the most sensitive indicators of effects. Most of these effects rapidly returned to preexposure normal when the animals were returned to clean air.##

01096

F. Stocks

ON THE RELATIONS BETWEEN ATMOSPHERIC POLLUTION IN URBAN AND RURAL LOCALITIES AND MORTALITY FROM CANCER, BRONCHITIS AND PNEUMONIA, WITH PARTICULAR REFERENCE TO 3:4 BENZOPYRENE, BERYLLIUM, MOLYBDENUM, VANADIUM AND ARSENIC. Brit. J. Cancer (London) 14, 397-418, 1960

of polycyclic hydrocarbons and a statistical process of lung cancer mortality is strongly correlated with smoke density in the atmosphere in Northern England and Wales. In 26 localities the smoke samples were analyzed in respect successive elimination was applied to discover which hydrocarbon was responsible for the smoke correlation with mortality rates. For lung cancer and bronchitis 3:4 benzopyrene emerges clearly as the substance of prime importance, with 1:12 benzoperylene contributing weakly for lung cancer, but for pneumonia 3:4 benzopyrene is apparently not important. The composite group of other cancers in males is correlated with several hydrocarbons, but cancers of the breast and other sites in females show no relations with any of them. In 23 localities spectrographic analyses for 13 trace elements were made and a similar process of successive elimination was applied to those which showed appreciable correlations with mortality rates. For lung cancer beryllium and molybdenum emerge as the elements of most consequence, with arsenic, zinc and vanadium showing weaker associations. For bronchitis molybdenum appears to be the important element in both sexes whilst males beryllium, arsenic, vanadium and zinc may also be concerned as for lung cancer. For pneumonia beryllium emerges as the important element in both sexes, with vanadium also concerned in males. With other cancer in males beryllium, molybdenum and vanadium show associations, but breast and other cancers in females show no relations with any element. (Author summary modified)##

01219

REPORT ON THE RESULTS OF INVESTIGATION OF THE EFFECTS OF AUTOMOBILE EXHAUST ON THE HUMAN BODY. Ruki Seijo [Clean Air -J. Japan Air Cleaning Assoc., Tokyo] 4(1):39-43, 1966.

The measurement of CO, soot, nitrogen oxides, SO2, SO3, and hydrocarbons and their medical psychological effects on the human body were investigated in September, 1965 in two regions with contrasting amounts of daily traffic. A quiet region to be considered was the vicinity of Ohara-machi Setagaya-ku, Tokyo and the other was in the vicinity of National Hygienic

Laboratory at Yoga-cho Setagaya-ku, Tokyo. The results are stated categorically for each air pollutant. To determine environmental effects meteorological data were supplied by Tokyo District Central Meteorological Observatory.

03270

W. J. Hamming and R. G. Lunche

EFFECTS OF EMISSIONS OF ORGANIC SOLVENTS ON LOS ANGELES PHOTOCHEMICAL SMOG. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd Monterey, Calif., 1961 153-84 pp.

Irradiation of mixtures of solvents and nitric oxide or solvents and auto exhaust will produce ozone, aerosols and eye irritation. The aromatic solvents produce the most eye irritation, and their effectiveness is about 6/10 of that of auto exhaust. The mixed ketones and chlorinated hydrocarbons are the next most active in producing eye irritation, and their effectiveness is about 1/5 that of auto exhaust; methyl ethyl ketone, the low-boiling alkanes, and the mixed alcohols are on the average, much less active in producing eye irritation. The high-boiling alkanes are unreactive. Relative to their effect on aerosol formation, or growth of aerosol, the solvents tested may tentatively be listed in the following order: 1. Aromatic Solvents, at 2 ppm + 1.2 ppm auto exhaust = greater increase in growth of aerosols 2. Chlorinated Hydrocarbons = Next in order = half the effect of aromatics or less 3. Mixed alcohols = Questionable effect on aerosol growth 4. LB Alkanes = Questionable effect 5. Mixed Ketones = May have slight effect 6. MEK = No effect 6. HB Alkanes = No effect. There is a general tendency for high concentrations of solvent to form more ozone than low concentrations. The quantities of ozone formed by irradiation of various solvents have the following orders of magnitude: (a.) Aromatics and HB alkanes produce about 1/15 ppm ozone per ppm of solvent. (b.) LB alkanes and chlorinated hydrocarbons produce about 1/20 ppm ozone per ppm of solvent. (c.) Mixed ketone (probably the active one is isobutyl ketone), 1/25 ppm ozone per ppm of solvent. (d.) Mixed alcohols and MEK form about 1/30 ppm ozone per ppm solvent. When mixed with auto exhaust at only 4 ppm the LB alkanes, HB alkanes and mixed ketone show ozone formation that has significant difference from that of auto exhaust alone. Under similar conditions both aromatic and Cl-HC show positive, but significant effect on ozone formation. A larger and more significant effect might be shown if 8 ppm of these solvents had been used. The effect of solvent on the formation of ozone when mixed with auto exhaust is much less than when they are mixed with nitric oxide and irradiated.##

03480

M. B. Cromwell

CHEMICAL CARCINOGENS, CARCINOGENESIS AND CARCINOSTASIS. Am. Scientist 53, 213-36, 1965

Many of the suspected environmental cancers of man have been reproduced in animals. Research in recent years has been intensified to gain more knowledge of the process known as carcinogenesis, which will eventually lead to the control of this scourge of mankind. This paper gives a brief account on the attempt made to interrelate facts and concepts concerned with the carcinogenic and carcinostatic action of certain organic chemicals, with special emphasis on the polycyclic hydrocarbon and heterocyclic compounds.##

03488

W. Haenszel and K. E. Taeuber

LUNG-CANCER MORTALITY AS RELATED TO RESIDENCE AND SMOKING HISTORIES. II. WHITE FEMALES. J. Nat. Cancer Inst. 32, (4) 803-38, Apr. 1964.

For a 10 percent sample of all white female lung-cancer deaths in the United States during 1958 and 1959, residence and smoking histories were collected from family informants and additional diagnostic details from certifying physicians. Residence and smoking histories were also obtained for a sample of the general population from the Current Population Survey. The findings for females agree on many points with earlier data reported for males: (a) higher lung-cancer risk, increasing with amount smoked for cigarette smokers in all population groups; (b) higher risks among residents of urban areas and metropolitan counties; (c) residence gradients in risk much smaller than smoking-class gradients; (d) accentuation of urban-rural contrasts in risks among lifetime residents; (e) higher risks for mobile populations with 3 or more exposure residences and for the foreign-born; (f) identification of the farm-born migrating to metropolitan counties as a high-risk group. The major difference between the results for each sex is that female smokers residing in urbanized areas did not display risks higher than those expected from the sum of 2 separate smoking and residence effects. Among nonsmokers, the male-female ratio for lung-cancer mortality was 3.3, a figure in line with the sex differential for most causes of death. Male smokers of 1 pack or less and more than 1 pack of cigarettes daily had lung-cancer rates 4 times higher than corresponding females. The possibility of reconciliation of the disparate risks for male and female smokers to bring them into line with the relationship holding for nonsmokers through more accurate measures of "effective exposure" is discussed. (Author summary)##

03490

E. F. Laspe, T. J. Hendo, W. B. Deichmann, H. G. Rye, and L. F. Palmer

EVALUATION OF CONJUGATED NITRO-OLEFINS AS EYE IRRITANTS IN AIR POLLUTION. Ind. Med. Surg. 27, (8) 375-7, Aug. 1958.

Distinct eye irritation owing to 2-nitro-2-olefins at low concentrations in air has been observed by two laboratories. For the butene and hexene derivatives, concentrations between 0.1 and 0.5 parts per million by volume have been shown to produce irritation within three minutes. For the corresponding acetone, irritation was observed only at concentration above 1.0.##

03602

W. H. Deichmann, M. L. Keplinger, G. E. Lanier

ACUTE EFFECTS OF NITRO-OLEFINS UPON EXPERIMENTAL ANIMALS (PRELIMINARY REPORT). A.M.A. Arch. Ind. Health 18, 312-9, Oct. 1958.

The nitro-olefins are very toxic compounds; they produce, in addition, marked local changes in the skin or enteric tract, depending upon the mode of administration. Their vapors cause marked irritation of the entire respiratory tract, skin, and eyes. Absorption from the respiratory or gastro-enteric tract, peritoneal cavity, or skin is very rapid, and signs of systemic intoxication appear promptly, including hyperexcitability, tremors, clonic convulsions, tachycardia, increased rate and magnitude of respiration, followed by a generalized depression, ataxia, cyanosis, and dyspnea. Death is initiated by respiratory failure and associated with asphyxial convulsions. Pathological changes were most marked in the lungs, regardless of the mode of administration of a compound. (Author summary)##

03652

M. Ogata and K. Sugiyama

STUDIES ON THE DETERMINATION OF URINARY HIPPURIC ACID IN TOLUENE POISONING. Japan J. Ind. Health (Tokyo) 4(5):9-16, May 1962. Text in Jap.

An experiment using Gaffney's method of determining urinary hippuric acid by paper chromatography is described: in a plastics factory, workers exposed to 50 ppm of toluene excreted 1.9 times the pre-exposure value of hippuric acid and another group exposed to 20 ppm excreted 1.9 times as much, which the authors think may indicate that the urinary hippuric acid excretion is proportional to the toluene concentration in the air. In another factory using a toluene-benzene mixture (4:1), urinary hippuric acid excretion was observed after exposure to this gas mixture. (Author summary modified)##

03678

J. Bogaev and I. Koprowska

A CYTO-PATHOLOGIC STUDY OF POTENTIALLY CARCINOGENIC PROPERTIES OF AIR POLLUTANTS. Acta Cytol. 5(5):311-319, Oct. 1961.

Comparative carcinogenic properties of air pollutants, tobacco tar and benzopyrene were tested by means of correlated cytopathologic studies, utilizing the uterine cervix of mice as a target organ. It was demonstrated that SPC and CJH mice treated intravaginally by air pollutants and tobacco tar develop cellular abnormalities and histologic lesions, which are morphologically indistinguishable from those accompanying the development of benzopyrene-induced carcinoma. The ultimate stage of development is, in general, reached later and is less advanced than in benzopyrene-induced lesions, so that after 95 weeks of

treatment, only a very small percentage of mice showed an early invasive carcinoma. The oscillating nature of cytologic findings observed in a series of consecutive smears of air pollution and tobacco tar-treated mice contrasted with the steady progression of benzopyrene-induced cellular abnormalities, and may suggest the presence of successive, possibly multicentric mucosal lesions, some of which desquamate entirely before others progress to invasive carcinoma. (Author summary)**

03600

J. M. Campbell and J. Clemmesen

BENZPYRENE AND OTHER POLYCYCLIC HYDROCARBONS IN THE AIR OF COPENHAGEN. Danish Med. Bull., 3(7):205-211, Nov. 1956.

Correlation between cigarette smoking, air pollution and lung cancer was the subject of investigations in Copenhagen. Four sampling stations were set up and sampling was carried out continuously between Oct 1954 to Oct 1955. Five compounds were determined regularly: anthracene, pyrene, fluoranthene, 3:4 benzpyrlene and 1:12 benzperylene. Results are presented graphically. Generally, the values for smoke content in micrograms/cu m at all 4 stations show a maximum in winter and a minimum in summer. In comparison with English towns, Copenhagen appeared to have pollution equivalent to that of an English country town. It is believed that even if the increase in the incidence of lung cancer in Copenhagen has developed in the practical absence of air pollution, the fact remains that it has not reached the level of heavily polluted towns, and there is a possibility that the pollution may contribute in some way to the cancer development mainly because of cigarette smoking.**

03702

J. M. Barnes

MODE OF ACTION OF SOME TOXIC SUBSTANCES WITH SPECIAL REFERENCE TO THE EFFECTS OF PROLONGED EXPOSURE. Brit. Med. J. (5260) 1097-1104, Oct. 28, 1961.

Biological mechanisms that are involved when human are exposed to a polluted atmosphere are reviewed. The categories covered are: (1) study of the toxic action, (2) irritant gases, (3) the pneumoconioses, (4) delayed biological effects, (5) conjugation and excretion, (6) biological effect of trichloromethylene, (7) effects on the central nervous system and (8) chemical carcinogens.**

03819

Vernot, E. H.

ANALYTICAL CONTROL OF CONTAMINANT CONCENTRATION IN EXPOSURE CHAMBERS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1960.

Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB Ohio. Contract AF 33(657)-11305, Proj. 6302. AMRL-TR-65-230, p. 27-33, Nov. 1965. 6 refs.
CFSTI, DDC: AD 629622

Methods used at the Toxic Hazards Research Laboratory in the control of low concentrations of contaminants introduced into exposure chambers of various sizes are outlined. For gases the method consists of pumping through a glass sampling tube or concentor, and isolation of the sample after sufficient pumping for equilibration. The concentor has a sidearm which can be capped for sub-sampling by syringes or which may be used for the addition of reagent solution. This method of sampling has proved superior to fritted bubblers. For nitrogen dioxide, the Saltzman method is used. For carbon tetrachloride, gas chromatography is used. Analytical techniques described require relatively simple operations which a technician can carry out with ease and precision. With this system, satisfactory control was maintained over contaminant concentrations in exposure chambers.##

01820

McNerney, J. M.

PRELIMINARY RESULTS OF TOXICITY STUDIES IN 5 PSIA 100% OXYGEN ENVIRONMENT. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wrwright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 98-123, Nov. 1965.
CFSTI, DDC: AD 629622

A 90-day continuous exposure of mice, rats, beagles and monkeys to a 5 pounds per square inch absolute and 100% oxygen environment produced the following pertinent results: A Wistar-derived strain of rats proved to be sensitive to altitude conditions early in the exposure (15% mortality within 14 days of exposure) whereas a Sprague-Dawley-derived strain proved resistant. A possible association of increasing serum glutamic pyruvic transaminase levels in beagles with length of exposure was found. Except for these factors, the experimental animals gave no apparent indication of being stressed throughout the exposure. A one-year study has been initiated to determine if the enzyme change was due to sampling or is indicative of an accumulating stress. No significant increase in the toxic response of animals to inhaled atmospheric contaminants (carbon tetrachloride, nitrogen dioxide, and ozone) under conditions of 5 psia and 100% oxygen was noted when compared with animals exposed under normal atmospheric conditions (except in the case of mice exposed to carbon tetrachloride). Based upon mortality data, a definite reduction in toxic response to pulmonary irritants was found in the presence of reduced pressure (5 psia) and 100% oxygen when compared with ambient pressure at the same concentration for two weeks continuous exposure. This difference in toxic response may be a beneficial effect derived from the increased partial pressure of oxygen in the experimental chambers even though total pressure has been reduced. Specifically, this is an increase in oxygen partial pressure from approximately 150 millimeters Hg pO2 to 355 millimeters Hg pO2. This increase in oxygen tension at the pulmonary surface may be acting therapeutically against the pulmonary edema

produced by the lung irritants, ozone and nitrogen dioxide. In the case of carbon tetrachloride, a systemic toxicant, no such benefits were observable.##

03821

Gauch, R. C.

REVIEW OF AIR FORCE DATA FROM LONG TERM CONTINUOUS EXPOSURE AT AMBIENT PRESSURE. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 128-133, Nov. 1965.
CFSTI, DDC: AD 629622

Work which was performed under Air Force sponsorship in the area of environmental toxicology of space cabin atmospheres over the past 5 years is described. This work gave the warning that materials in trace quantities could prove toxic when presented to animals over long continuous exposure periods. Four exposure chambers were constructed for this work. This permitted use of one for a control group of animals and three for contaminant exposure chambers. All animals were followed by a number of clinical laboratory examinations before, during and following the 90-day exposure, and the animals were terminally given stress tests and then necropsied with both gross and microscopic examination of tissues. Carbon tetrachloride, while not causing death at 25 ppm, did cause serious clinical and microscopic liver changes in all animals exposed. The livers of the rats were so much involved that the pathologist made a diagnosis of "cirrhosis". Phenol caused absolutely no problems whatsoever at the 5 ppm level hydrogen sulfide (20 ppm) did produce death in rats and mice, but none in monkeys. Methyl mercaptan (50 ppm) caused serious problems and death in 40% of the monkeys and 43% of the mice. Tests were conducted to find out whether animals could perform strenuous tasks following the 90-day exposure and to compare the long term, continuous toxicity of some propellants and propellant types in which the Air Force has an interest. Hydrazine, unsymmetrical dimethyl hydrazine, nitrogen dioxide and decaborane were tested as candidate materials. The results are discussed.##

03822

Siegel, J.

REVIEW OF AMBIENT PRESSURE ANIMAL EXPOSURE DATA FROM SELECTED NAVY COMPOUNDS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 134-141, Nov. 1965.
CFSTI, DDC: AD 629622

Studies have been oriented toward operational requirements in a resolution of existing or anticipated problems, although basic research aspects are included in the Navy mission. For example, there was, and still is, a constant need to search for better methods of contaminant generations, for more reliable methods of

analysis and monitoring, for new bio-chemical predictors, and for new ways of getting more information from the exposed animal. Some chamber modifications, animals used, parameters studied, and classes of materials studied are discussed. Experimental results and plans for the future for the Navy Toxicology Unit are summarized.##

03023

Hyatt, F. G.

LONG TERM INHALATION EXPOSURE EXPERIENCE WITH REFERENCE TO AIR POLLUTION. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965. Aerospace Medical Research Lab., (65701h), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 148-165, Nov. 1965.
CFSTI, DDC: AD 629622

As part of the overall program by the Division of Air Pollution the Laboratory of Medical and Biological Sciences has been charged with studying the biological effects of plants and animals, including man, of chronic exposures, long term exposures to air pollution as it exists in the ambient atmosphere of communities. The concentration has been on mixtures of normal air pollution, not single agents or simple mixtures of pure gases. The initial studies discussed primarily are concerned with chronic exposure to auto exhaust-contaminated atmospheres, both raw auto exhaust as it comes from the tail pipe, as well as irradiated auto exhaust which simulates the photochemistry that occurs due to sunlight. The results with laboratory animals are discussed.##

03039

S. Carson, B. Goldhaber, H. S. Weinberg

CHARACTERIZATION OF PHYSICAL, CHEMICAL AND BIOLOGICAL PROPERTIES OF MUCUS IN THE INTACT ANIMAL. Ann. N.Y. Acad. Sci. 130, 935-43, Sept. 30, 1966. (Presented at the Interdisciplinary Investigation of Mucus Production and Transport Conference, New York City.)

The selective sensitivity of the mucus sheath component of the mucociliary system of intact cats in respect to induced environmental changes is discussed. An assessment is made of the relative utility of in vitro and in vivo studies, with special emphasis on the latter for the determination of responses to acute as d chronic exposure to cigarette smoke. Reactivity to acute exposures is considered as a function of macromolecular constituents of the mucus. The resiliency of the system is demonstrated by the reversibility of the changes effected. In addition, a method for simple in vivo measurement to determine "apparent viscosity," is presented.##

01666

P. Stock

AIR POLLUTION AND CANCER MORTALITY IN LIVERPOOL HOSPITAL REGION AND NORTH WALES. Intern. J. Air Water Pollution 1, 1-13, 1958.

Filters designed to collect for analysis samples of the "smoke" present in the outdoor air at 17 localities in the Liverpool and North Wales region have been in operation continuously for periods of 1 to 3 years, and data are given of the average concentrations during 6 months in respect of total smoke, 3:4-benspyrene, 1:12-benzperylene pyrene, fluoranthene and sulphur dioxide. These are correlated with the density of population per acre and with the standardised mortality ratios for cancers of the lung and of the intestine. Another 6 filters have operated in the Mersey road tunnel, a bus garage, a motor garage and an office in Liverpool, and comparisons are made between the concentrations of smoke and of its various constituents in the air inside and outside these confined spaces. The work is continuing, with inclusion also of spectrographic analysis of trace elements, and only provisional conclusions can be drawn as yet. (Author abstract)**

01698

03898
H. Matufuji and T. Sakai

HEMATOLOGICAL STUDY ON TRI - AND PERCHLORETHYLENE WORKERS. Japan J. Ind. Health (Tokyo) 6, (9) 5-10, Sept. 1963. Text in Jap.

No remarkable abnormality was found in examinations of the erythrocyte counts, hemoglobin values, hematocrit readings, specific gravity of blood, and differential counts of leucocytes in 136 male and 26 female workers exposed to tri - and perchlorocthylene vapors. (Author summary modified)**

01900

K. Hosiyama, H. Hinai, H. Kita, H. Shishido, K. Sawada, and Y. Onozawa.

THREE CASES OF APLASTIC ANEMIA IN FEMALES CAUSED BY BENZENE AND TOLUENE. Japan J. Ind. Health (Tokyo) 6, (11-12) 11-18, Dec. 1964. Text in Japanese.

In a small factory using benzene and toluene, 13 of 15 workers suffered from chronic benzene-toluene poisoning. Pure benzene had been used about 5 yr as a solvent, then toluene only (May - October) and toluene with 5% benzene for over 5 years. In June, 1964, the concentration of toluene vapor in the factory was 150-550ppm and in a living room in the third floor, 30ppm. The authors consider that aplastic anemia may have been caused in 3 out of 4 females who had worked 9 hr daily and stayed on the second or third floor of the factory at night for 1-10 yr. (Author summary modified)**

03902

S. Horiguchi, S. Morioka, T. Utsunomiya, K. Shinagawa, and T. Kosmari.

A SURVEY OF THE ACTUAL CONDITIONS OF ARTIFICIAL PEARL FACTORIES WITH SPECIAL REFERENCE TO THE WORK USING TETRACHLOROETHANE. Japan J. Ind. Health (Tokyo) 6, (4) 17-22, Apr. 1964. Text in Japanese.

Elimination of the use of tetrachloroethane as a solvent in artificial pearl factories reduced industrial poisoning. This conclusion was made in a study of 127 coating workers chosen from 11 factories who were given health screening tests in Nov. 1960. Lowered specific gravity of whole blood and a decrease in white cell count were found in 10% of the workers; 23% had a positive result in the urobilinogen test, and 24% had subjective symptoms of the digestive system. Medical examinations were conducted on the workers in three factories (A, B, and C) using tetrachloroethane with air analysis of the working environment in July, 1960 and in Nov. 1961. In July, 1960, the concentration of tetrachloroethane in the air was as high as 70-220 ppm. Lowered specific gravity of whole blood was seen in 12 of 18 workers examined; a decrease in red cell count was seen in 44% of the 18, relative lymphocytosis was seen in 83% of the 18, a positive result in the urobilinogen test was seen in 39%, and neurological findings were seen in 39%. Since the first survey, factories A and C had abandoned the use of tetrachloroethane on their own initiative, while factory B still used it. In Nov. 1961, air analysis of factory B showed 20 ppm. The medical examinations in Nov. 1961 showed remarkable improvement in the health of the workers in factories A and C. (Author summary modified)**

03911

G. I. Solomin

DETERMINATION OF MEAN DAILY MAXIMUM PERMISSIBLE CONCENTRATION OF ISOPROPYLBENZENE AND ITS HYDROPEROXIDE IN THE ATMOSPHERE. Hyg. Sanit. 31, (4-6) 388-91, Apr.-June 1966. Russ. (Tr.)
CFSTI, TT 66-51160/4-6

Isopropylbenzene concentration of 0.014 mg/cu m and isopropylbenzene hydroperoxide concentration of 0.007 mg/cu m and their mixtures in concentrations of 0.0074 and 0.0037 mg/cu m had no effect on animals after continuous exposure for 80 days. The recommended mean daily maximum permissible concentrations of isopropylbenzene and isopropylbenzene hydroperoxide should be at the level of the maximum one-time permissible concentrations. If both substances are present at the same time the total maximum concentration is calculated by simple addition of their effects. In the organism, isopropylbenzene and isopropylbenzene hydroperoxide are converted to phenol and excreted with the urine.**

03938

I. G. Ramadov, A. R. Ramadov, Pavlova

VARIATION IN ASCORBIC ACID CONTENT IN THE ORGANISM OF ANIMALS CHRONICALLY EXPOSED TO SMALL CONCENTRATIONS OF HYDROCARBONS. Hyg. Sanit. 31, (9-6) 299-303, Apr.-June 1966. Russ. (Tr.) CFSTI, TT-67-51160/6-6

Low concentrations of gasoline vapor to which animals were exposed in a chronic experiment (mean calculated values not over 3 mg/l) caused disturbances in the vitamin C exchange in the experimental animals. Intermittent exposure to gasoline vapor had a more deleterious effect than continued exposure to corresponding concentrations. The greatest changes in vitamin C balance were exhibited by animals subjected to concentrations which increased steadily or fluctuated abruptly during the exposure. Variation in the daily diuresis and vitamin C contents in the blood and urine revealed phases which were related to the length of exposures and the exposure regimens.##

03621

03621
V. Fleurova-Bergerova, J. L. Radomski, J. E. Davies, and J. H. Davis

LEVELS OF CHLORINATED HYDROCARBON PESTICIDES IN HUMAN TISSUES. Ind. Med. Surg. 35, (1) 65-70, Jan. 1967.

The storage and accumulation of chlorinated hydrocarbon pesticides in the tissue of humans of various age group was studied. These studies were limited to the analysis of adipose tissue, since available colorimetric procedures were not sufficiently sensitive to detect pesticides in the other tissues of the body. The application of gas chromatography to pesticide analysis and the development of the electron capture detector have made possible the analysis of pesticide levels in these other tissues. In this investigation the fat, liver, kidney, brain and gonads of 71 people were analyzed as part of a total community study on pesticides in Dade County, Florida. The pesticides analyzed were lindane, p,p'-DDT, p,p'-DDE, p,p'-DDD, and dieldrin. (Author abstract)##

03978

S. W. Nichols, J. Hawkins, L. J. Painter

STATISTICAL SURVEY OF DATA RELATING TO HYDROCARBON AND OXIDES OF NITROGEN RELATIONSHIPS IN PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution 10, (1) 19-23, Jan. 1966.

Results from various photochemical irradiation chamber experiments were examined by statistical procedures to determine the effect of hydrocarbon and oxides of nitrogen concentrations on eye irritation. The regression equations are given together

with graphs drawn from these equations. Some aspects of the practical interpretation of the results are discussed. Data on existing ambient concentrations of hydrocarbon and oxides of nitrogen in the Los Angeles atmosphere are compiled. (Author abstract)##

04037

B. A. Rusakovskaya

INVESTIGATION OF THE EFFECT OF AIR POLLUTION ON THE HEALTH OF CHILDREN . Tr. Leningr. Sanit. Gigien. Med. Inst. 31, 36-40, 1956. Russ. (Pr.)

Previous studies of air pollution in Leningrad are reviewed and data from these studies including concentrations of SO2 and effects on human lungs are presented. Results of experimentally induced tumors in mice are reviewed. An x-ray and fluoroscopic study is made of the lungs and lymph glands of two groups of children of both sexes. One group resided in the vicinity of a power station and a coke oven gas plant and the control group did not; all children had resided in their areas at least five years. It is inferred from the results of the study that the greater degree of air pollution in the industrial areas was at least indirectly responsible for the pulmonary changes observed in that group of children.##

04051

F. Stocks

A STUDY OF TOBACCO SMOKING, AIR POLLUTION, RESIDENTIAL AND OCCUPATIONAL HISTORIES AND MORTALITY FROM CANCER OF THE LUNG IN TWO CITIES. Preprint. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1961.)

The methodology of this epidemiological survey of two English cities is described and a broad comparison of the results made. Tabulations and appendices provide details necessary for future simultaneous study of multiple factors in populations of many cities in different parts of the world. The purpose of this study was to test and standardize methods to be used, make modifications when desirable and publish the detailed data with a view to assembling comparable data as the project continues. Responses of health authorities responsible for population surveys and for air pollution analysis and measurement indicated that the methods devised have worked well and can be applied to other cities.##

04070

B. B. Iasnetsova

EXPERIMENTAL BASIS FOR THE DETERMINATION OF ALLOWABLE ATMOSPHERIC LIMITS IN ATMOSPHERIC AIR. Gigiena i Sanit. 28, (2) 3-8, Feb. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

Acetophenone is used in chemopharmaceutical, aniline dye and organic synthesis industries. For this reason such industries constitute potential sources of atmospheric air pollution with acetophenone. The basic sources of air pollution are production of acetone and of phenol by the cumene method of which acetophenone is a side product. Experiments for the determination of acetophenone in the atmospheric air were conducted by the method of V. A. Khrustaleva which was based on the reaction between acetophenone and m-dinitrobenzene which resulted in the production of a rose-colored substance, the intensity of which was proportional to the concentration of acetophenone; the test color is compared with a freshly prepared color scale. Maximal single dose of acetophenone in atmospheric air was determined by the threshold of acetophenone odor perception method, and by the effect of low acetophenone concentration on eye sensitivity to light, and by the electroencephalographic method. The threshold of acetophenone threshold odor perception for most sense persons was determined as 3.01 mg/cu m, and the maximal nonperceptible concentration (subthreshold concentration was determined as 0.01 mg/cu m. The threshold of acetophenone reflex activity on eye sensitivity to light determined as 0.01 mg/cu m. Inhalation of 0.007 mg/cu m acetone-air mixture for a short time elicited changes in the electrical brain activity but was inactive at 0.001 mg/cu m concentration. Chronic 24-hour inhalation of 0.07 mg/cu m of acetophenone under chronic experimental conditions elicited no detected changes in the above mentioned indexes. It is recommended that 0.003 mg/cu m be adopted as the maximal single and 24-hour concentration limit for acetophenone in atmospheric air.##

05081

M. I. Gusev and M. M. Cheliabova

EXPERIMENTAL DATA AS A BASIS FOR THE DETERMINATION OF THE MAXIMAL PERMISSIBLE AMYLENES (PENTENES) CONCENTRATION IN ATMOSPHERIC AIR. Gigiena i Sanit. 28, (5) 3-8, May 1963. Russ. (Tr.) (Translated by S. S. Loving in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

It was established that 1.8 mg/cu m of amylene in the atmospheric air represented the concentration of threshold odor perception of the substance. Continuous 24 hour exposure of white rats to the inhalation of air containing 9.8± of 0.51 mg/cu m of amylene for 75 days elicited statistically significant enhanced porphyrin metabolism, lowered cholinesterase activity, and increased number of luminescent leucocytes. In addition, the animals' pattern of established reflex responses had become disturbed. Some microscopic histologic changes had been noted in the organs and tissues of autopsied rats, most noteable among which were pathologic lung changes. Exposure of rats to the inhalation of 1.9 ± or -, 0.22 mg/cu m of amylene under similar experimental conditions elicited none of the above enumerated changes, with very slight postmortem exceptions. On the basis of the above discussed results, it is recommended that the maximal permissible amylene concentration in atmospheric air be set at 1.9 mg/cu m.##

04084

N. S. Siobina

THE TOXICITY OF LOW STYROL VAPOR CONCENTRATIONS. Gigiena i Sanit. 28, (5) 29-35, May 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

Statistical comparative evaluation of morbidity and work time loss records of workers employed in plants producing polystyrol disclosed high rates of liver and gall bladder morbidity, fall in arterial blood pressure and a variety of complaints characteristic of systemic intoxication with styrol vapor. Since the prevailing styrol vapor concentration in the air of the plant was below the permitted 0.5 mg/liter concentration it was assumed that the official limit was set too high. Chronic experiments with animals exposed to the inhalation of 0.05 mg/liter of styrol vapor impaired the glycogenic liver function, the liver parenchyma and brought about many other pathologic functional and morphologic changes in the experimental animals. Some of the pathologic changes were reversible, others were permanent. Results of tests performed with rats indicated that 0.005 mg/liter of styrol vapor concentration constituted its threshold of harmful effect for rats. It is recommended that 0.005 mg/liter of styrol vapor be adopted as the maximal permissible concentration in the air of working premises.##

04087

V. A. Chishinov

EXPERIMENTAL DATA AS A BASIS FOR THE DETERMINATION OF MAXIMAL PERMISSIBLE TOLUYLENE DIISOCYANATE CONCENTRATION IN ATMOSPHERIC AIR. Gigiena i Sanit. 28, (6) 8-15, June 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The concentration of toluylene diisocyanate threshold odor perception for most sensitive persons was experimentally established as 0.2 mg/cu m and the maximal odor nonperceptible concentration was established at 0.15 mg/cu m. The concentration of toluylene diisocyanate threshold effect on electric brain activity was established at 0.1 mg/cu m, while 0.05 mg/cu m concentration elicited no changes in the electric brain activity. The maximal single permissible toluylene diisocyanate concentration in atmospheric air should be set at 0.05 mg/cu m. Exposure of white rats to the inhalation of air containing 1.0 or 0.2 mg/cu m of toluylene diisocyanate 24 hours daily for 84 days caused the animals to lose weight, brought about increased cholinesterase activity, changed muscle antagonists motor chronaxy, and disturbed the protein fraction ratios, and the process of porphyrin metabolism. In 0.02 mg/cu m concentration, toluylene diisocyanate had no observable unfavorable effects on the organism of the exposed experimental rats. Based on the results of the present investigation, it is recommended that 0.03 mg/cu m be accepted as the maximal average 24 hour toluylene diisocyanate concentration in atmospheric air.##

04093

N. V. Alayeneva

EXPERIMENTAL DATA AS A BASIS FOR THE DETERMINATION OF MAXIMAL PERMISSIBLE PORAPHORE CHKh 3-5 CONCENTRATION IN THE AIR OF WORKING PREMISES. Gigiena i Sanit, 30(7):18-23, July 1965. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

Toxicity parameter of paraphore CHKh 3-5 was determined by administering the substance to experimental animals intragastrically. Results showed that LD100 equalled 0.5 g/kg, LD50 equalled 0.35 g/kg, and the maximal tolerance dose equalled 0.2 g/kg. The closeness between the tolerance and lethal dose characterizes paraphore as a substance having a narrow toxic activity zone. Experimental inhalation of paraphore in 20 - 30 and in 7 - 10 mg/cu m concentrations for a short time, and in 2 - 5 mg/cu m concentrations for a long time killed the experimental animals, clearly indicating that paraphore CHKh 3-5 was a highly toxic preparation. Results of the investigation brought out the dominant effect of paraphore CHKh 3-5 on the erythrocytes and on the central nervous system, the first being in the nature of hypoxia and the second in the nature of profound pathomorphologic changes in experimental animals which died as a result of the paraphore administration. Chronic effect of paraphore dust inhalation in average concentration of 0.6 mg/cu m elicited reversible functional shifts in the red blood cells and in the arterial blood pressure; slight functional changes in the nervous system and in cholinesterase activities were transient. Based on the experimental data it is recommended that 0.05 mg/cu m of paraphore CHKh 3-5 in the air of working premises be adopted as its maximal permissible concentration.##

04104

O. O. Arkhipova, T. A. Kovbasheva, and N. N. Shishkovskaya

TOXIC PROPERTIES AND BIOTRANSFORMATION OF BENZOTRICHLORIDE. Gigiena i Sanit, 28, (10): 30-4, Oct. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)
OTSUTS: PT 65 61439

Benzotrichloride is a toxic substance. Air containing 1 mg/l of benzotrichloride vapor was lethal to white mice and rats. Experimental animals subjected to acute benzotrichloride poisoning developed irritated conjunctiva and mucous membranes of the upper respiratory tract, dyspnea and disturbances of the nervous system. A single exposure to the toxic effects of benzotrichloride elicited in the experimental animals vascular disturbance in the internal organs and in the brain, catarrhal desquamative bronchitis and focal purulent pneumonia, also dystrophic liver degeneration. Repeated benzotrichloride inhalation possessed the potentiality of eliciting chronic intoxication paralleled by loss of weight, leucopenia, and fall in arterial blood pressure. Repeated benzotrichloride inhalation elicited in the experimental animals changes at the point of its entrance, of which purulent bronchitis and pneumonia were the

greatest along with changes which indicate general resorption of the substance and its capacity to disturb the blood circulation system, to produce dystrophic liver, kidney and suprarenal changes, as well as profound changes in the cortical layers of nerves, and in the thalamo, hypothalamic region. Benzotrichloride is partly eliminated with the urine as hippuric acid. Benzotrichloride penetrated through intact skin, and elicited symptoms of poisoning, such as leucopenia and alopecia. Damage done to intact skin by the direct application of benzotrichloride healed very gradually. (Author conclusions)**

04107

N. N. Burkatskaya and G. A. Voitenko

ORIENTATION DATA FOR THE DETERMINATION OF MAXIMAL PERMISSIBLE DDT CONCENTRATION IN THE AIR OF WORKING PREMISES. Gigiena i sanit., 28, (11) 36-9, Nov. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: PB 66 61429

DDT inhalation proved toxic to warm blooded animals. The minimum toxic DDT concentration in the air under conditions of acute experiments was 0.005 mg/l for cats and toxic effects were produced by 0.03 mg/l. In chronic experiments 0.008 mg/l of DDT in the air elicited sharp symptoms of intoxication and 0.15 mg/l proved to be the LD50 for cats. Inhalation of air containing an average of 0.003 mg/l of DDT was harmful to workers' health, the gravity of the poisonous effect increased with the DDT employment record. It is recommended that the maximal permissible DDT concentration in the air of working premises be set at 0.0001 mg/l or 0.1 mg/cu m. (Author conclusions)**

04109

O. O. Shapiro and I. Ya. Antsupova

BIOSTIMULATIVE PROPERTIES OF CRUDE OILS FROM DIFFERENT OIL FIELDS. Gigiena i Sanit., 27, (6) 18-21, June 1962. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)
CFSTI: PB 66 61429

Results of the investigations show that crude oil coming from the Ishimov, Gnedintsi, Romashki, Radchenkov and Rokhmanov oil fields possessed biostimulative properties. Results of the investigations, show that the biostimulative properties of the crude oils and of their derivative products differed to some extent with the concentration of paraffin contained in them. The results showed that the greater was the paraffin concentration in the crude oil, the more intensive was its biostimulative activity. The same was true of the crude oil tar-pitch and of the crude oil cracking residue. The biostimulative effects of crude oil derivatives lubricating and cooling oils may be eliminated or greatly reduced; it is recommended that such oils be prepared from crude oil, the paraffin content of which originally was or was artificially reduced to less than 1%. (Author conclusions)**

04110

N. N. Ginsburg

THE ROLE PLAYED BY PARAFFIN THE BLASTOMOGENICITY OF CRUDE OIL. Gigiena i Sanit., 28, (11) 87-92, Nov. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.) CFSTI: TT 66 51429

A critique is presented of "Blastomogenic Properties of Crude Oils from Different Oil Fields," Gigiena i Sanit., Vol. 27, No. 6, pp. 38-41, June 1962 (APTIC 5109) which was by Prof. D. D. Shapiro and I. Ya. Metmanets.##

04111

E. A. Kaplsky

ORIENTATION DATA FOR THE DETERMINATION OF MAXIMAL PERMISSIBLE ALPHA-METHYL STYROL CONCENTRATION IN THE AIR OF WORKING PREMISES. Gigiena i Sanit., 28, (12) 16-22, Dec. 1963. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.) CFSTI: TT 66 51429

Results of experimental, clinical and physiological studies had shown that alpha-methyl styrol had a definite effect on the central nervous and cardiovascular systems; its action on the peripheral blood produced mild polychromic anemia. Chronic exposure to the effects of alpha-methyl styrol may produce trophic and metabolic changes. Examination of workers in contact with alpha-methyl styrol vapor should include arterial pressure, mucous membranes of the upper respiratory tracts, and the peripheral blood picture. The presence of some upper respiratory diseases in applicant workers should be regarded as contraindicative to their employment requiring contact with alpha-methyl styrol vapor. Results of clinical observations showed weakening of the liver function; wherever this is the case workers should be carefully examined as a prophylactic measure against any possibility of toxic hepatitis development. It is recommended that 0.005 mg/l of alpha-methyl styrol be adopted as the maximal permissible concentration in the air of working premises. (Author conclusions)##

04124

R. D. Stewart

POISONING FROM CHLORINATED HYDROCARBON SOLVENTS. Am. J. Nursing 67, (1) 86/87, Jan. 1967.

The fundamentals of the toxicology of the more common chlorinated hydrocarbon industrial solvents is reviewed for nurses in industry and emergency rooms. The predominant effect is central nervous system (CNS) depression proportional to the amount absorbed which is different for each solvent. Each differs, also, in its capacity to injure organs such as the liver and kidneys. Emergency treatment is supportive to combat the effects of the

CNS depression. The signs and symptoms of acute overexposure in the order of increasing severity are: lightheadedness, dizziness, lack of fine coordination, lethargy, mental dullness, drunkenness, unconsciousness, hypotension, respiratory arrest, and anesthetic death. The maintenance of an adequate airway is essential and assisted respiration may be required. When the CNS symptoms have subsided, attention is directed toward the detection of liver or kidney injury.##

04192

S. Sato

RESULTS OF A HEALTH EXAMINATION ON BENZENE WORKERS AND THE EFFECT OF THIOCTIC ACID. Japan. J. Health (Tokyo) 2, (6) 39-41, June 1960. Jap.

Decreased blood cell counts and positive urobilinogen were found in a health examination in a few of the 17 workers engaged in painting with benzene mixtures. Positive albuminuria and coproporphyrinuria were not found in any of them. The examination included counts of red and white blood cells, tests of protein, urobilinogen and coproporphyrin in the urine. Subjective symptoms such as feelings of fatigue, headache, vertigo, general weakness, and intestinal disorders were reported in many of them. The relative number of constituent leucocytes, specific gravity, and hemoglobin content of the blood sugar and urobilinogen contents in the urine were measured in five subjects who had both subjective symptoms and defective blood counts just before, one week after, and at the end of the intravenous administration of thioctic acid of 25 mg/day for 2 weeks. During these 2 weeks, a marked increase of the red and white cell counts, specific gravity of the whole blood, and hemoglobin contents as well as a marked decrease of urobilinogen excretion in the urine was noted but there was no improvement of the relative counts of the leucocytes. (Author summary modified)VS

04198

I. Hara

HEALTH SUPERVISION OF ORGANIC SOLVENT HANDLERS. Japan J. Ind. Health (Tokyo) 3, (8) 331-6, Apr. 1961. Jap.

The blood composition of workers has been improved since the use of benzene was stopped after the deaths of 4 women in a vinyl shoe factory and 2 men in printing plant due to benzene poisoning over several years. Cases of poisoning by carbon tetrachloride, tetrachloromethane, trichloroethylene, methyl acetate, methylethylketone, cresol, and tetrahydrofurange have also been reported recently in many other industries. There is a tendency to use substitutes for benzene and an increase in the use of mixed solvents is prevalent. Attention must be paid to the toxic activity of these solvents and the difficulty in diagnosis of psycho-neurological symptoms due to solvent poisoning. Measures should be taken to make note of the components of the solvents, such as in the obligation of labeling and in the execution of analysis. In recognition of the degree of exposure, the determination of the atmospheric concentration and of the toxic

substances and their metabolites in the blood and urine must be made. Examination of objective psycho-neurological symptoms is very important and electrophysiological studies should be promoted for such symptom diagnosis. (Author summary modified)(6

04177

M. Girard, Malmin, R. Fourel, and F. Valot

LYMPHOMA AND CHRONIC OCCUPATIONAL BENZENE POISONING. Lymphome et intoxication benzolique professionnelle chronique. Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris) 27, (10-11) 781-6, Nov. 1966. Fr.

A possible connection between an 11-yr industrial exposure to benzene and a diagnosis of lymphoma, 8 yr after the termination of the exposure is discussed. The worker was exposed to benzene vapors as the result of gaging operations and leaky pumps involved in the preparation of a motor fuel containing 10% benzol from 1948 to 1956, when the benzol was eliminated. The diagnosis of lymphoma was indicated by splenomegaly, with hepatomegaly and polyadenopathy, and confirmed by the examination of blood, marrow, and ganglia. The worker had records of blood examinations from 1949-65 showing a progressive elevation of the leucocytes. The rarity of reports showing a relation between lymphoma or lymphocytic leukemia may result from the delay period of 5 to 13 yr for the development of symptoms. In all cases involving lymphoma or blood pathology, any past exposure to benzene should be explored.(6

04253

B. P. Portnoy

CHRONIC EFFECT OF CERTAIN COMPONENTS OF EXHAUST GASES FROM MOTOR CARS. (Khronicheskoe deistvie na organizm zhivotnykh nekotorykh komponentov vykhlopnykh gazov avtomobilei.) Hyg. Sanit., 31, (9) 261-6, Sep. 1966. Russ. (6).
(PDXV: DT 64-51140/7-6

Analysis of the motor-car exhaust gases and of the air of the highways by separate chromatographic methods revealed comparably high concentrations of pentane and benzene. Their concentrations in the atmosphere attained 4 mg/cubic meter and their ratio was about 1:1. A 25-hr poisoning of albino rats for a period of 86 days showed that pentane and benzene at concentrations of 95.7, 50 and 10 (at a ratio of 1:1) had no significant effect on the animal's body and it was only at a concentration of 1 mg/cubic meter that they had an effect at all on the behavior of the animals, their weight, the motor activity of muscle antagonists, the blood pressure and the cholinesterase level. (Author summary)(6

04283

N. V. Baltrieva

MAXIMUM PERMISSIBLE CONCENTRATION OF TETRACHLOROETHYLENE IN FACTORY AIR. (Materialy k obosnovaniyu predel'no

dopustimoi kontsentratsii tetrakhloretilena (perlena) v vozdukhe proizvodstvennykh pomeshchenii.) Hyg. Sanit. 31, (9) 387-92, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

The toxicity of tetrachloroethylene was investigated with a view toto formulating hygienic standards. Acute and chronic exposure studies were conducted on rats using varying concentrations of the compound. The effects were investigated by electrophysiological, biochemical, and histological methods. Based on the results of these studies, it was recommended that the maximum permissible concentration of tetrachloroethylene in factory air should be 0.03 mg./l.##

04258

I. N. Frolova

MAXIMUM PERMISSIBLE CONCENTRATION OF P-CHLOROPHENYL ISOCYANATE IN FACTORY AIR. (Materialy k obosnovaniyu predel'no dopustimoi kontsentratsii parakhlorfenilizotsianata v vozdukhe proizvodstvennykh pomeshchenii.) Hyg. Sanit. 31, (9) 401-3, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

The effects of p-chlorophenyl isocyanate were studied in experiments on 152 white mice, 12 albino rats and 5 rabbits. The substance was found to be toxic with respect to laboratory animals when inhaled or ingested, whereas it toxicity was only slight in the case of cutaneous application. The median lethal concentration for inhalation by white mice was 0.053 6 or - 0.034 mg/l (0.081 to 0.045 mg/l). The threshold concentration for rabbits, determined from variations in the characteristics of the unconditioned reflex, was found to be 0.001 mg/l, with an increase in the time necessary for the development of the reflex ensels strain. Experiments on the inhalation of PCIC were performed by the dynamic method. Since the limital and the sublimimal concentrations of the substance in question were found to be 0.008 mg/l and 0.0005 mg/l, respectively, as determined from the irritating effects (tested on human volunteers), it was possible to recommend a tentative maximum permissible concentration of PCIC at the level of 0.0005 mg/l.##

04321

L. S. Jaffe

THE NATURE AND EFFECTS OF PHOTOCHEMICAL AIR POLLUTANTS ON MAN AND ANIMALS. I. GENERAL CHARACTERISTICS AND COMMUNITY CONCENTRATIONS. Preprint, 1967.

Photochemical smog consists of mixtures of gaseous and particulate products resulting from atmospheric photochemical reactions of gases evolved from the combustion of organic fuels for heat and power. Ultraviolet radiation from sunlight initiates a series of atmospheric reactions between the oxides of nitrogen and photochemically reactive organic substances, such as the olefins, aromatic hydrocarbons and aldehydes. The photochemical oxidants are a major class of compounds found in commonly photochemically polluted air. They consist of a dynamic complex

mixture of oxidising substances which vary in time and place. Nonetheless, they can be measured routinely as "total oxidant", i.e., the net oxidising effect of all substances in the atmosphere. Ozone and the peroxyacyl nitrates (PAN compounds or PANs), a homologous group of organic peroxidic nitrogen compounds, have been identified as important oxidants formed in photochemical smog. Ambient "total oxidant" levels serve as useful practical indices of the intensity of photochemical smog and of various biological and physical manifestations of photochemical air pollution. The sources, characteristics and methods of measurement of the photochemical oxidants are described. Specific aerometric data on the oxidant concentrations found in various urban communities in the United States are provided. These levels are sufficiently high to cause specific adverse effects on man, animals, vegetation and certain materials (rubber and textiles). (Author abstract)##

08616

B. F. Dills

ULTRASTRUCTURAL ALTERATIONS OF ALVEOLAR TISSUE OF MICE (I. DUE TO HEAVY LOS ANGELES SMOG). Arch. Environ. Health 12, (6) 699-07, June 1966.

These animal exposure stations have been in operation for 3 years in the Los Angeles area to ascertain the effects of smog on mice. During the course of this study alterations in the fine structure of the alveolar tissue have been observed. Control animals were kept in rooms with well filtered air. Similar groups were in other rooms continually breathed the ambient air. The lungs of groups of mice ranging from 2 to 21 months old were prepared for electron microscopy. Each particular "group" of animals represented at least four or five mice, and the results are illustrated in this report.##

08500

C. C. Wang and G. F. Evans, Jr.

ACUTE GASOLINE INTOXICATION. Arch. Environ. Health 2, 715-6, June 1961.

A case of acute fatal poisoning from the inhalation of gasoline fumes is presented. Gasoline is an anesthetic agent with a very narrow margin of safety, causing death by respiratory arrest in most cases. The maximal permissible concentration of gasoline vapor for prolonged exposure is 500 ppm. There is a continuous need for thorough and repeated indoctrination of workers with toxic fuels concerning the hazards involved in their improper handling.##

04539

D. Hoffman, E. Theiss, and E. L. Wynder

STUDIES ON THE CARCINOGENICITY OF GASOLINE EXHAUST. J. Air Pollution Control Assoc. 15, (4) 182-5, Apr. 1965.

gasoline engine exhaust tar was demonstrated to be carcinogenic to the experimental animal. The activity of exhaust tars is to a major extent due to the presence of four, five, and six ring condensed, aromatic hydrocarbons. This concept was confirmed by large-scale separations and mouse skin tests of four main fractions and five subfractions of the neutral portions of exhaust tar and by comparison with the activity of the whole tar. The emission of polynuclear aromatic hydrocarbons and phenols in gasoline engine exhaust depends on the fuel used. Other methods for the reduction of these agents in gasoline engine exhaust were discussed. Used crank-case oil and blowby tar were biologically inactive. The primary purpose of these investigations has been to study the carcinogenicity of gasoline engine exhaust in an experimental setting. (Author summary)##

08881

W. D. Wan and J. F. Thomas

DEVELOPMENTAL WORK ON BIOASSAY TECHNIQUE FOR ATMOSPHERIC POLLUTANTS. Natl. Cancer Inst. Monograph 9. 1963. pp. 59-69. (Presented at the Analysis of Carcinogenic Air Pollutants Symposium, Cincinnati, Ohio, Aug. 30-31, 1961.)

A bioassay technique for carcinogenic activity has been developed, with bacteria as "test animals" and morphological and biochemical changes as indicators of the activity. Striking morphological alterations were noted in heart infusion broth cultures of Bacillus megaterium supplemented with benzo(a)pyrene and 3-methylcholanthrene. These anomalies were not apparent in cultures supplemented with noncarcinogenic hydrocarbons such as phenanthrene and anthracene. The addition of hydrocarbons to the heart infusion broth medium did not appreciably affect the growth rate of the organisms. Biochemical examinations of B. megaterium were made with cultures grown in a simple, chemically defined medium that contained glucose as the sole energy source. Morphological alterations did not develop in these cultures supplemented with carcinogenic hydrocarbons, but a growth suppression was noted. Other significant findings concerned lipide synthesis, aerobic glycolysis, and infrared spectra of lipide material.##

08883

E. L. Wynder and D. Hoffmann

A STUDY OF AIR POLLUTION CARCINOGENESIS: III. CARCINOGENIC ACTIVITY OF GASOLINE ENGINE EXHAUST CONDENSATE. Cancer 15, (1) 103-8, Feb. 1962.

The benzene extract of a gasoline engine exhaust condensate has about twice the carcinogenic activity of tobacco smoke condensate in terms of skin tumors in mice. The degree of greater activity of automobile exhaust "tar" is not readily correlated with the fact that the concentrations of known carcinogens in this material range from 50 to more than ten times the concentrations in cigarette smoke condensate. The possibility of cocarcinogenic factors is being considered. The biological findings of this study cannot be directly applied to man. Whereas one is exposed

directly to the tobacco smoke condensate, automobile exhaust is diluted several thousand times before reaching the lung. The present study serves as a baseline for subsequent investigations with other types of automobile exhaust "tar" and air pollutants. (Author summary)##

06575

F. L. Eaton J. H. Hunt

THE IN VITRO EFFECTS OF ALIPHATIC NITRO COMPOUNDS ON TISSUES. Arch. Environ. Health 1, 47-52, July 1960.

The oxygen consumption of whole pol/morphonuclear leukocytes and homogenates of heart and liver from guinea pigs was determined in the presence and in the absence of aliphatic nitro hydrocarbon. Saturated (C1-C3) and unsaturated (C3) aliphatic nitro compounds were inhibitors at low concentrations. As the concentration of the nitro compounds was increased, the oxygen consumption passed through a plateau and increased with further increase in the concentration of the nitro compound. (Author conclusions)##

06589

P. Kotin and H. L. Falk

AIR POLLUTION AND LUNG CANCER. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 140-2. 1963.

Author discusses polluted air in relation to other environmental factors concerned with the pathogenesis of lung cancer, and reviews data which warrants this investigation. A synthesis of the findings described suggests that the carcinogenic properties of polluted urban atmosphere provide at least two indispensable links in the pathogenesis of lung cancer: (1) The environmental presence and the host entry of agents proved experimentally to be carcinogenic and epidemiologically associated with increased liability to development of lung cancer; and (2) The occurrence of host-modifying factors in the atmosphere which by virtue of their effect on the ciliated mucus secreting epithelium of the tracheobronchial tree, facilitate the deposition and abnormal retention of particular matter in the lungs. Author states that although reduction in lung cancer incidence may be possible by reducing concentrations of carcinogenic agents in the air, removal of the remaining sources of irritants and carcinogenic agents from the respiratory environment will be necessary to achieve any significant reductions.##

06590

E. L. Wynder and D. Hoffmann

PREPARED DISCUSSION: AIR POLLUTION AND LUNG CANCER. Proc. Natl. Conf. Air Pollution, Washington, D.C., 1962. pp. 143-6. 1963.

Epidemiological data have established an "urban factor" for lung cancer, the exact basis of which, however, remains to be determined. Laboratory data have presented several factors that in the experimental setting contribute to the induction of cancer. In view of these considerations, in addition to other health problems associated with air pollution, a reduction of pollutants in the atmosphere is certainly a step to be desired. Work in the field of air pollution is essential, not only because of the potential health problems, immediate and distant, that are involved, but also because of the general scientific knowledge which can be gained. These studies will contribute to knowledge of the possible interrelationship of carcinogens, cocarcinogens, anticarcinogens, site-static components, and infectious agents as well as possible climatic factors on the induction of lung cancer.##

06645

L. G. Wayne

EYE IRRITATION AS A BIOLOGICAL INDICATOR OF PHOTOCHEMICAL REACTIONS IN THE ATMOSPHERE. Atmos. Environ. 1, (2) 97-106, Mar. 1967. (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, Apr. 1965.)

Studies involving the quantitation of eye irritation produced by experimental exposure of humans to synthetic atmospheres are discussed. The principal methods used are panel measurements of intensity, threshold, or response delay. Advantages and difficulties of each method are reviewed, as well as characteristics of the data generated and appropriate means of manipulating the data. Evidence regarding the possible chemical identity of irritants in photochemical smog is discussed, leading to the conclusion that not all observed eye irritation is accounted for by additive effect of formaldehyde, acrolein, and peroxyacyl nitrates. Implications of the findings for air pollution control policies are considered. As one of the undesirable manifestations of photochemical smog, eye irritation has been the subject of a number of studies in recent years. This article reviews several of these studies with particular reference to those aspects relevant to air pollution research and air pollution control policy. (Author abstract)##

06650

F. L. Bates

THE EFFECT OF INITIAL CONCENTRATION OF REACTANTS ON THE BIOLOGICAL EFFECTIVENESS OF PHOTOCHEMICAL REACTION PRODUCTS. Atmos. Environ. 1, (2) 159-71, Mar. 1967.

Synthetic air pollution mixtures were produced by the irradiation of air containing nitrogen dioxide and butene-1 in an all-glass flowing system. The percentage of butene-1 consumed increased with the initial nitrogen dioxide concentration in the range of 3.3 to 5.5 ppm. Further increase in the nitrogen dioxide concentration led to less butene disappearance. After the first 50-60 min of irradiation, the amount of

butene and of nitrogen dioxide which disappeared was constant. This observation, along with the small variations in oxidant analysis, suggested that photochemical products were not markedly changed with time. The amount of the reactants consumed and the inhibition of the subsequent growth of H. coli was a function of the initial ratio of the reactants. A butene-nitrogen dioxide ratio of 20 was most inhibiting. On doubling the concentration of the reactants, the inhibition factor doubled also. When the activity was determined with a glutamate substrate, the decrease in activity of glutamic dehydrogenase was linear with time of exposure of the enzyme. The activity of the enzyme was less inhibited in the reverse direction with an alpha-keto glutarate substrate. (Author abstract)##

04701

C. A. Hau, J. Neal, and V. Stenbridge

A STUDY OF THE PHYSIOLOGICAL EFFECTS OF CARBON BLACK (I. INGESTION). A.M.A. Arch. Ind. Health 17, 21-8, Jan. 1958.

The continuous feeding to mice of whole and extracted carbon black in massive quantities for prolonged periods of time leads to no detectable changes from the normal in the mice fed. Carbon black may have an adsorbed component which can be removed by extraction with hot benzene. The free benzene-extractable adsorbed component when fed, mixed with dog food, to mice can and does lead to tumor formation in the stomach of the mice. The same results are obtained when methylcholanthrene, a carcinogen, is fed to mice in a similar manner. Extracted carbon black can effectively adsorb methylcholanthrene. In the adsorbed state, the methylcholanthrene loses its carcinogenic potency.##

04702

C. A. Hau, J. Neal, and V. Stenbridge

A STUDY OF THE PHYSIOLOGICAL EFFECTS OF CARBON BLACK (II. SKIN CONTACT). A.M.A. Arch. Ind. Health 18, 511-20, Dec. 1958.

Report covers study on skin contact with the "whole" carbon black, extracted carbon black, the "free" benzene extract of carbon black, a known carcinogen, and, finally, a known carcinogen adsorbed to a carbon black. Carbon blacks as manufactured and used produce no observable harmful effects following skin contact. Carbon blacks have adsorbed a component which, when free, and applied to the skin of mice, produces skin cancer. The adsorbed component is ineffective as a carcinogen. Carbon blacks can adsorb effectively known carcinogens such as methylcholanthrene and 3,4-benzpyrene and by such adsorption do eliminate or reduce the carcinogenicity of these substances.##

04703

C. A. Hau, J. Neal, and V. A. Stenbridge

A STUDY OF THE PHYSIOLOGICAL EFFECTS OF CARBON BLACK (III. ADSORPTION AND ELUTION POTENTIALS; SUBCUTANEOUS INJECTIONS).

Arch. Environ. Health 1, 512-33, Dec. 1960.

This study deals with adsorption and elution possibilities and the possible effects of subcutaneous or intraperitoneal injection of various channel or furnace carbon blacks. The carbon blacks used in this study are representative of all blacks now in common use. Their properties are well defined and reviewed. Author concludes that neither blood plasma nor gastric juice elutes any significant adsorbed component when a channel or furnace black is suspended in either medium for as long as seven days. Channel black binds benzpyrene adsorbed artificially so firmly that it cannot be removed completely by benzene extraction. No significant extraction of either channel or furnace carbon black was accomplished with gastric juice to which 10% roasting oil was added when contact was maintained for 7 days. The subcutaneous or intraperitoneal injection in mice of channel or furnace carbon black leads to no significant changes from the normal. The benzene extractives of furnace blacks when injected in oil into mice lead to tumor formation. Carbon blacks, channel or furnace, can adsorb and bind known carcinogens so effectively that no tumors are produced when the adsorbed material is injected subcutaneously.##

04705

J. Neal and R. H. Rigdon

ABSORPTION AND EXCRETION OF BENZPYRENE WHEN FED TO MICE. Texas Rept. Biol. Med. 22, (1) 156-64, 1964.

Benzpyrene is demonstrable spectrophotometrically in the kidney and the liver of mice fed 20 mg. of the crystals per gram of laboratory chow. The skin and the viscera have a blue fluorescence. The urine likewise is blue when observed with ultraviolet light. Benzpyrene is rapidly eliminated from the body when food containing this hydrocarbon is discontinued, as indicated by the absence of blue fluorescence in the skin and the viscera, and the failure to demonstrate this hydrocarbon spectrophotometrically in the kidney.##

04706

J. Neal, R. Thorton, and U. A. Rau

POLYCYCLIC HYDROCARBON ELUTION FROM CARBON BLACK OR RUBBER PRODUCTS. Arch. Environ. Health 4, 598-606, June 1962.

Suggestions that elution from carbon black as a component of rubber tubing, conveyor belting, gasket or sealing materials might occur from contact with oils, food juice components, gastric or intestinal juices, led to the studies of carbon black and rubber test materials containing 10% to 20% by weight of carbon black. The following conclusions have been drawn: There is no significant elution of polycyclic hydrocarbons by: (a) human blood plasma, (b) artificial gastric juice, or (c) artificial intestinal juice from the various types of channel or furnace carbon blacks made and commonly used in industry. There is no

significant elution of polycyclic hydrocarbons from test rubber sheets (for fatty or nonfatty foods), prepared according to a practical formulation obtained from a commercial rubber fabricator, by: (a) cottonseed oil, (b) aqueous citric acid, pH, 3.05, (c) 5% aqueous acetic acid, (d) 5% aqueous sodium bicarbonate, (e) 5% aqueous sodium chloride, (f) whole milk (homogenized). Benzene extraction of gastric juice leads to a spectrophotometric evaluation different from benzene extraction of a gastric juice to which carbon black has been added. It appears that carbon black removes some thing from gastric juice rather than adds something to it. Artificial gastric juice eluates no detectable polycyclic compounds from a channel carbon black to which significant amounts of 3,4-benzpyrene have been added (adsorbed), showing the extensive adsorption potential of the carbon black.##

04708

A. M. Dogan

CARCINOGENIC CHEMICAL SUBSTANCES IN THE ENVIRONMENT. (O kantserogennykh deistvyushchikh khimicheskikh veshchestvakh v okruzhayushchei srede.) Hygiene and Sanitation (Gigiena i Sanit.) 29 (12) 87-93, Dec. 1964. Russ. (Tr.)

This review of the carcinogenic substances generally present to some degree in man's everyday environment lists the following examples and situations: (1) air quality and the fact that statistics disclose that there is a greater occurrence of lung cancer in cities than in less smoke polluted areas; (2) smoking and the fact 3,4-benzpyrene, a carcinogen found in polluted city air, is also to be found in cigarette smoke; (3) contamination of foodstuffs with processing chemicals; (4) apparatus with rubber parts which may have been stabilized with soot, which upon aging may disintegrate and contaminate food stuffs, as in the case of milking machines; (5) carcinogenicity of certain drugs; and (6) hydrocarbons present in coal and petroleum. Ways of identifying carcinogens or the carcinogenicity of a substances are discussed and include spectrographic and biological methods.##

04709

R. H. Digdon and J. Neal

ABSORPTION AND EXCRETION OF BENZPYRENE ORIGINATING IN THE DUCK, CHICKEN, MOUSE AND DOG. Texas Rept. Biol. Med. 21, (2) 247-61, 1963. (Presented at the Annual Meeting, American Association for Cancer Research, Southwestern Section, New Orleans, La., Nov. 16-17, 1962.)

Large amounts of benzpyrene crystals and/or benzpyrene suspended in a physiologic solution of sodium chloride with a 1 per cent solution of polysorbate 80 have been given orally to ducks, chickens, mice and dogs and intratracheally to ducks with no noticeable acute injurious effect. Benzpyrene has been demonstrated spectrophotometrically in the blood and bile of the chickens and dogs and in the blood of the duck. The presence of this hydrocarbon in the blood and bile is influenced by the interval elapsing between the injecting of the benzpyrene and the

since the sample was obtained. The skin of the chicken and mouse has a dazzling blue fluorescence with ultraviolet light following oral administration of benzpyrene. The mesentery, gallbladder, kidney and urine of the mice fluoresce. The kidney of the chicken and duck likewise fluoresces. Macroscopic observations of tissues with ultraviolet light and photography of the specimen may be helpful in the biological study of hydrocarbons. (Author summary)00

08710

B. H. Higdon and J. Neal

EFFECT OF FEEDING BENZO(A)PYRENE ON GROWTH OF YOUNG MICE.
Texas Rept. Biol. Med. 24, (3) 483-8, 1966.

Observations are reported on the growth of mice fed benzo(a)pyrene before and after weaning. The average weight of litters of mice, nursing mothers fed benzo(a)pyrene, was less than that of litters from lactating mothers fed a normal ration. Some of the young mice were very small, almost dwarf like. This decrease in weight started at 10 to 12 days of age. After the young mice were weaned and fed a standard ration, their weight continued to be lower. This diminution in weight apparently was due to a decrease in nutrition and not to a toxic effect resulting from benzo(a)pyrene.00

08711

B. H. Higdon and J. Neal

EFFECT OF INTRATRACHEAL INJECTION OF BENZO(A)PYRENE IN DUCKS.
Texas Rept. Biol. Med. 23, (3) 498-508, 1965.

A variety of pulmonary tumors were previously reported to have developed in the respiratory tract of white Pekin ducks following an intratracheal injection of methylcholanthrene. However, only one microscopic tumor, a questionable carcinoma, occurred in a group of 9 ducks given 200 mg of benzo(a)pyrene crystals intratracheally. Chronic inflammation and metaplasia did occur. No pulmonary tumors were present in the respiratory tract of ducks given an intratracheal injection of carbon black or carbon black with benzo(a)pyrene absorbed. A chronic reaction frequently occurred in the lungs when carbon black was injected intratracheally. Two ducks injected intratracheally with 200 mg of benzo(a)pyrene developed multiple cysts in the retroperitoneal region. Since no other ducks have been observed with similar cysts, it is suggested that they developed as the result of this carcinogen. (Author summary modified)00

08712

B. H. Higdon and J. Neal

EFFECTS OF FEEDING BENZO(A)PYRENE ON FERTILITY, GROWTH, AND YOUNG MICE. J. Nat. Cancer Inst. 34, (2) 297-305, Feb. 1965.

mice fed rations containing 0.25, 0.5, and 1.0 mg of benzo(a)pyrene per g of food absorb this hydrocarbon and develop a blue fluorescence. Benzo(a)pyrene was demonstrated spectrophotometrically in the kidney of some of these mice but not in the embryos. Apparently the maximum amount of benzo(a)pyrene that is absorbed is metabolized, metabolite is responsible for the blue fluorescence. This blue fluorescence decreases rapidly when the benzopyrene-containing ration is discontinued. Mice do not like rations containing benzo(a)pyrene after they have been fed standard laboratory pellets. Their weight decreases and the weight curve correlates with the amount of food consumed. Mice fed the ration containing 1.0 mg of benzo(a)pyrene from weaning readily eat it and gain at the same rate as mice fed laboratory pellets. In time mice will adjust to eating food containing this hydrocarbon; however, cannibalism frequently occurs when the higher concentrations of benzo(a)pyrene are fed. This hydrocarbon in the concentrations fed these mice had no injurious effect on fertility or on the developing embryos. Mice fed 1.0 mg of benzopyrene per g of food for their entire lives reproduced. No malformations were observed and, if resorption of any embryos did occur, it was not evident.##

08713

B. H. Higdon and J. Neal

FLUORESCENCE OF CHICKENS AND DOGS FOLLOWING THE FEEDING OF BENZPYRENE CRYSTALS. Texas Rept. Biol. Med. 21, (4) 558-66, 1963.

The skin, feathers and viscera of young chicks, fed for 6 days a commercial ration containing 0.1 to 2.5 mg of benzpyrene per gram of food, fluoresced blue. This blue fluorescence disappeared within 6 days when the benzpyrene-containing food was discontinued. Baby chicks readily ate food containing 2.5 mg of benzpyrene per gram of food and progressively gained in weight. No deaths occurred during the 24 days they were fed the benzpyrene-containing food. Benzpyrene apparently is absorbed from the intestines and is metabolized within the body. This blue fluorescence may be due either to benzpyrene or to one of its metabolites. The skin, feathers, viscera and eggs from hens fed 0.5 and 0.1 mg of benzpyrene per gram of food fluoresced a blue color. The amount of benzpyrene fed to these chickens apparently produced no injurious effects. All birds fed this hydrocarbon are now under observation for the development of neoplasms.##

08716

B. H. Higdon and J. Neal

GASTRIC CARCINOMAS AND PULMONARY ADENOMAS IN MICE FED BENZO(A)PYRENE. Texas Rept. Biol. Med. 24, (2) 195-207, 1966.

White Swiss mice, as used in these experiments, fed commercial laboratory pellets rarely had spontaneously occurring tumors in the stomach but did have spontaneously occurring pulmonary adenomas. Benzo(a)pyrene crystals, added to the commercial ration in

concentrations of 0.25 and 1.0 mg per g of food and fed routinely to the mice, resulted in papillomas and squamous cell carcinomas in the first portion of the stomach and an increase in the number of pulmonary adenomas. All the mice fed the 1.0 mg benzo(a)pyrene-containing ration for 60 days or longer had gastric neoplasms. Mice born of parents fed benzo(a)pyrene during pregnancy and lactation, and fed the control ration when weaned did not develop gastric tumors although litter mates fed benzo(a)pyrene did. The histologic characteristics of these gastric and pulmonary lesions were the same as described by other investigators. In this study no deaths were attributed to the toxic action of benzo(a)pyrene.##

08723

M. P. Smith, A. A. Albaiin, and P. B. Shafer

CHEMICALLY INDUCED METHEMOGLOBINEMIAS IN THE MOUSE. Biochem. Pharmacol. 16, 317-28, 1967.

Nitrobenzene, aniline, p-aminotoluene (p-AT), p-aminoacetophenone (p-APA) and p-aminopropiophenone (p-APP) have widely different activities as methemoglobin-forming agents in mice. As assessed by circulating levels after intraperitoneal administration, p-AT was the least potent compound of the series, but nitrobenzene and aniline were also only weakly active even at lethal doses. Three hydroxylamine analogues from the above series were all about equipotent as methemoglobin-forming agents in mice. Moreover, at a dose of 0.1 m-mole/kg each produced a transient methemoglobinemia that was remarkably similar to that resulting from p-APP. A methemoglobinemia with similar temporal characteristics was also produced by o-aminophenol, but this compound is about ten times less potent. p-Aminophenol was even weaker, being about as active as aniline. When aniline or nitrobenzene was given in combination with sodium nitrite, circulating methemoglobin levels were prolonged. Such a synergism was not seen when either was given in combination with p-APP. Methylene blue in vivo attenuated the methemoglobinemic response to both p-APP and nitrite. It was more effective, however, against the latter, as evaluated at doses that produced equivalent peak circulating levels. In its time pattern the effect of nitrite was similar in vivo (intact animal) and in vitro (mouse red cell suspension). In contrast, methemoglobinemia produced by phenylhydroxylamine appears to persist longer in red cells than in the intact animal. Apparently, factors external to the red cell are important in terminating some kinds of induced methemoglobinemias. (Author abstract)##

08738

A. A. Thomas

AEROSPACE TOXICOLOGICAL RESEARCH. Proc. NATO AGARD Conf. (Paris) (3) 359-78, Sept. 1965.

The major areas of aerospace toxicology such as propellant toxicology, environmental pollution, and space cabin environment are reviewed. Because of the short duration, high level, and infrequent exposures, the industrial threshold limit values are

aeeatiagiaea. The philosophy of emergency exposure assumes that no one will be intentionally exposed to high concentrations of propellant vapors under ordinary conditions; if there is exposure, subjective and objective symptomatology may occur, but pathology should be reversible and the performance of the operator must not be impaired. Valuable information from the aerospace toxicological research projects includes: exposure data that can be applied to community air pollution problems, new high-energy propellants which are potential pharmacological research tools, and a better understanding of the oxygen toxicity problem.&&

04829

R. J. H. Coimbatch, C. R. Gloss, and J. A. Nadel

EFFECTS OF 48/80 ON THE MECHANICAL PROPERTIES OF THE LUNGS. J. Appl. Physiol. 21,(2) 279-82, Mar. 1966.

Injection of 48/80 into the right ventricle of paralyzed, vagotomized, artificially ventilated cats increased total pulmonary resistance (RL), end-expiratory transpulmonary pressure and pulmonary arterial pressure and decreased pulmonary compliance (CL), functional residual capacity, and femoral arterial pressure. CL decreased before RL increased; the changes were prolonged and incompletely reversed by large inflations of the lungs. The changes in CL and RL were similar to those produced by right ventricular injections of histamine, and suggest that 48/80 leads to constriction of alveolar ducts. Premedication with polymethylene salicylic acid prevented these effects, but aspirin, salicin, tripelennamine hydrochloride, lysergic acid butanolamide, and heparin were not effective. These findings are consistent with the possibility that the 48/80-induced changes depend on histamine release.

04901

R. B. Wilson

FATE OF PESTICIDES IN THE ENVIRONMENT - A PROGRESS REPORT. Trans. N.Y. Acad. Scei. 28, (6) 696-705, Apr. 1966. (Presented at a Division of Environmental Sciences Meeting, Mar. 2, 1966.)

Pesticides can move horizontally and vertically by such means as leaching, erosion, and run-off and can reach areas far removed from the original sites of application. It is insufficient to know only the persistence of the parent compound; one must know the fate of the compound until it is degraded to its simplest components. Soil, water, fisheries, insects and plants were selected as eventual investigative sites for pesticides. The pesticides investigated were the following: dichlorodiphenyltrichloroethane, cyclodiene, malathion, 1-naphthyl N-methyl carbamate, Linuron, Diphenamid, Vernam, and methyl N-(3,4 dichlorophenyl) carbamate. The conclusion is that more research is needed if rational judgments on the hazards presented by pesticides in the environment is to be adquately analyzed.&&

04927

B. A. Abbasat and B. P. Smith

THE INFLUENCE OF METHAEMOGLOBINAEMIA ON THE LETHALITY OF SOME TOXIC ANIONS. I. Acids. Toxicol. Appl. Pharmacol. 6, (5) 576-83, Sept. 1964.

The time course and extent of the methaemoglobinaemia induced by intraperitoneal sodium nitrite and p-aminopropiophenone (PAPP) have been characterized in female mice. The peak methaemoglobin formation (MMB) from sodium nitrite (75 mg/kg) is achieved in about 40 minutes. Comparable levels from PAPP (15 mg/kg) are achieved more quickly (between 5 and 10 minutes) but decline more rapidly to normal. Both nitrite- and PAPP-induced methaemoglobinaemia afford a significant degree of protection against poisoning by sodium azide when administered in an appropriate time sequence. It was not possible under the same circumstances to protect mice against death from fluoride, arsenate, thiocyanate, selenate, or borate, although some prolongation of survival time was seen after fluoride. The formation of the azidemethaemoglobin complex has been demonstrated within intact mouse red blood cells, and small amounts of the complex were identified in vivo in an antidotal situation. It is considered important that the protective action of methaemoglobinaemia has been demonstrated to date only against established inhibitors of cytochrome oxidase. (Author summary)##

049681

AIR QUALITY CRITERIA FOR THE PHOTOCHEMICAL OXIDANTS. Public Health Service, Washington, D.C., Division of Air Pollution. Sept. 1966. 276 pp.

This document surveys published (and about to be published) scientific information on the occurrence of photochemical oxidants in polluted air and the effects of these oxidants on various receptors. On the basis of this survey, criteria are presented for the informational use of municipal, state, and interstate air pollution control agencies. The sources of the photochemical oxidants, methods of measurements, and typical atmospheric concentrations in various communities are described. Current information on the relationship between the photochemical oxidants and eye irritation and other effects on humans, various effects on animals and plants, effects on materials, and effects on visibility (haze formation) are summarized. This review includes results of both laboratory studies and ambient air exposure studies, and, for man, the results of industrial and experimental exposures and the findings of clinical and epidemiological studies. Tables summarize the reported effects of ambient photochemical smog. Supplemental data are provided to cover the effects of pure ozone or peroxyacyl nitrates--both important atmospheric photochemical oxidants--on plants, animals, and humans exposed in laboratory studies by various investigators. A bibliography at the end of the document lists the important references reviewed in its preparation. (Author introduction modified)##

05178

L. G. Wayne

THE CHEMISTRY OF URBAN ATMOSPHERES (TECHNICAL PROGRESS REPORT-VOLUME III). Los Angeles County Air Pollution District, Calif. Dec. 1962. 233 pp.

A major part of the research conducted by the Los Angeles County Air Pollution Control District has been concerned with the effects of fuel composition on smog, potencies of various compounds as precursors of eye irritation, identification and study of reaction products in photochemical systems, and plant disease of polluted atmospheres. These studies have been supplemented by research projects of other institutions. The objectives, methods, and findings of such recent research in smog chemistry comprise the subject matter of the following chapters. The status of research dealing with eye irritation as a manifestation of photochemical smog, including some discussion of the biochemic concepts involved in the measurement of eye irritation are discussed in Chapter 2. Various suggestions as to the chemical identity of the eye irritants are critically considered. Harmful effects of smog on plants are discussed in Chapter 3. Participation of various primary and secondary contaminants in the photochemical reactions in smog is studied in Chapter 4. Detailed consideration is given to the light-absorbing characteristics of primary pollutants and the chemical consequences of light absorption. Evidence about the development of photochemical products as secondary pollutants is critically reviewed, with special attention to the role and identity of a unique class of compounds, first discovered in the course of smog research, known originally as "compound X". A reaction catalogue has been compiled (Chapter 5) listing the elementary reactions known or suspected to be important in the development of photochemical smog. The experimental evidence regarding the importance of airborne particulate matter in the chemistry of air pollution is reviewed in Chapter 6.00

05231

B. P. Gusinov, V. N. Tugarinova, O. I. Vasil'yeva, N. V. Sifontova, and L. N. Shabad

THE CARCINOGENIC PROPERTIES OF EXHAUST GAS SOOT OF MOTOR TRANSPORT. Gigiena i Sanit., 27, (3) 19-24, 1962. Russ. (Tr.) Translated as JPRS 15,691:1
Gigiena i Sanit. 27,(3)19-24,1962. Russ. (Tr.) Translated as JPRS 15,691.)

At the present time it is well known that in atmospheric air, products of incomplete combustion of fuel may be present, in which there are carcinogenic hydrocarbons. Among them the most common and best studied is 3,4-benzpyrene, which possesses a strong carcinogenic effect. Among the sources of contamination of the air with this carcinogen the exhaust gases of motor transport occupy one of the leading places. The objects of this study were samples of soot scraped from the inner surfaces of exhaust pipes of automobiles with carburetor motors operating on gasoline and of trucks with diesel motors operating on solar oil. As experimental animals, use was made of mice of the black C57 and brown C57 strains. Two procedures were used: cutaneous applications and

subcutaneous injections. Tar was applied to the skin in a 20% benzol solution in a type of eye drops in the interscapular region over an area of one 1.5 centimeters three times a week. The tar applications were continued until the animals died. The results obtained led to the conclusion that the soot of exhaust gases of motor transport with carburetor motors possesses a blastomogenic effect, which the same soot from diesel engines does not possess.

05238

A. I. Konstantinova, and N. D. Chertova

LUNG CANCER MORBIDITY IN RELATION TO AIR POLLUTION. Gigiena, San, 30 (10), 104-8 (1965). Russ. (7r.) (Translated as JPRS 33,623.)

In recent decades a considerable rise in the lung cancer morbidity and mortality rates has been noted throughout the world. A factor which plays a large role in the etiology of this disease, is contamination of the air with dust containing carcinogenic substances. In view of the fact that the air in the industrial section of Ufa is contaminated with the discharges of petroleum refineries and chemical and machine-building plants, it was decided to study the effect of the environment upon the occurrence of lung cancer in the clinic. Case histories of tissues and statistical data on lung cancer morbidity and mortality were studied over a period of 10 years. The data show that the lung cancer mortality rate among individuals over 30 years of age is higher in the industrial section of the city.

05284

M. P. Hsu-Hsi

NEW DEVELOPMENTS IN CHEMICAL CARCINOGENESIS BY POLYCYCLIC HYDROCARBONS AND RELATED HETEROCYCLES ; A REVIEW. Cancer Res. 26, (9) 1811-21, Oct. 1966.

This paper is limited to the salient facts, interpretations, and theories concerning the carcinogenic polycyclic hydrocarbons and their heterocyclic analogs which have been investigated within the last decade. It comprises four parts: I. Improved Methods of Analysis of Carcinogens and Analogous Heterocyclics; II. Relationships between Chemical Structure and Activity in Principal Groups of Newly Investigated Compounds; III. Experimental Evidence; and IV. Endogenous Biosynthesis of Carcinogenic Hydrocarbons. Various bio-assay methods are discussed. Nuclear magnetic resonance spectroscopy, Rayleigh depolarized light diffusion, and the study of complex-formation processes give valuable information on the molecular properties which can be coordinated with carcinogenic activity. Non-condensed hydrocarbons, condensed hydrocarbons and heterocyclic analogs without K- and L- zones, or where the molecule's K-region is not free for biochemical interaction, naphthacenes, hypercondensed hydrocarbons with at least 6 benzene rings, polycyclic nitrogen compounds containing more than one N-heterocycle are discussed with regard to carcinogenic activity. Although there is not yet any proof that living organisms are able to synthesize polycyclic aromatic hydrocarbons, carcinogenic or

act, most of the reactions through which known metabolites of the cell could in theory be converted into such hydrocarbons are already known to occur endogenously, and others are conceivable. Cholesterol has been considered as a possible source of carcinogen endogenesis. An interesting finding has been the anticarcinogenic activity of apocholic acid, a modified bile acid.##

05290

05298
C. H. Pan, J. H. Hunt, and F. L. Eaton

A COMPARATIVE PROCEDURE FOR EVALUATING ANTIMICROBIAL ACTIVITY OF GASEOUS AGENTS. Appl. Microbiol. 9, (1) 45-56, Jan. 1961. (Presented at the 59th General Meeting, Society of American Bacteriologists, St. Louis, Mo., May 1959.)

A dynamic method for comparison of the antimicrobial activities of gaseous agents is proposed. Specially designed apparatuses for multiple exposure and growth of organisms are described and the validity of the method is discussed. Three gases, ethylene oxide, methyl bromide, and formaldehyde, and five bacteria, Escherichia coli, Bacillus cereus, Bacillus megaterium, Bacillus licheniformis, and Staphylococcus aureus, were tested and compared. Typical data are presented to demonstrate the results. Application of this dynamic method for the investigation of the mechanism of action of gas sterilization is suggested.##

05299

W. W. Payne and W. C. Hueper

THE CARCINOGENIC EFFECTS OF SINGLE AND FRACTIONATED DOSES OF 3,4-BENZPYRENE. Am. Ind. Hyg. Assoc. J. 21, (5) 380-5, Oct. 1960. (Presented at the 31st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 25-28, 1960.)

The aromatic hydrocarbon carcinogen 3,4-benzpyrene was administered to mice by subcutaneous injection in a graduated series of single and repeated monthly doses. For the smaller single doses, the number of tumors increased and the latent period decreased with increased amounts of benzpyrene. As the single dose was increased further a plateau was reached and an increase in the amount of benzpyrene did not increase the carcinogenic effect. For repeated monthly doses, a similar plateau was not observed in the dose range used in this experiment. Except for the very small doses, a given total amount of benzpyrene produced a larger percentage of tumors when it was injected in twelve monthly doses than when it was administered in a single injection. For 0.5 milligram, the largest dose used, the effect was almost threefold. For the repeated injections, there was a longer time interval from the first injection to the first appearance of tumors than for the single injections. At least for mice, a given amount of carcinogen is more effective when it is administered in small increments over a long period of time than when it is administered in a single dose. Conversely, it appears that a low-level, recurring exposure to a carcinogen is more hazardous than a single exposure to the same total amount. (Author summary modified)

05304

Shabad, L. M.

EXPERIMENTAL RESEARCH ON THE LINK BETWEEN ATMOSPHERIC POLLUTION AND LUNG CANCER. Intern. J. Air Water Pollution 7, (5) 321-30, 1963

The experimental study of the carcinogenic effect of air pollution and its role in the etiology of cancer of the lung is discussed with particular reference to work in the USSR. The carcinogenic hydrocarbon 3:4-benzpyrene has been shown to be present in the atmosphere and in the smoke from Russian cigarettes. Tarry products from air pollution have been tested by skin painting and subcutaneous experiments in mice and malignant tumours were obtained in about 8 per cent of cases. Adenomatous lung tumours were also produced in mice. Earlier experiments had also shown that painting the skins of mice with tar increased the number of lung adenomas. Further, when the progeny of these painted animals were themselves painted with tar, lung adenomas occurred twice as frequently as in the parents. (Author abstract)

05372

Herreid, R. McD.

THE EFFECTS OF BENZO(A)PYRENE, CIGARETTE SMOKE CONDENSATE AND ATMOSPHERIC POLLUTANTS ON THE RESPIRATORY SYSTEM OF SYRIAN HAMSTERS. Acta Union Intern. Contra Cancer 19, (3-4) 710-4, 1963.

Benign and malignant tumors of the trachea, bronchi, and bronchioles have been induced in Syrian hamsters following the intratracheal instillation of benzo(a)pyrene suspended in Tween 60. So far only atypical epithelial changes, suggestive of precancerous lesions, have been observed with benzo(a)pyrene suspended in distilled water. No significant changes were noted in the animals that received intratracheal instillation of benzo(a)pyrene dissolved in olive oil. These findings suggest that both the vehicle and the physical state of the carcinogen are important factors in carcinogenesis. The intratracheal instillation of cigarette smoke condensate and atmospheric pollutants produced regenerative epithelial changes of the tracheobronchial mucosa. These lesions included basal cell hyperplasia, and peribronchial and peribronchiolar proliferation. Atmospheric pollutants often induced extensive adenomatous proliferation that involved large areas of the lung. No tumors of the respiratory tract have been induced with cigarette smoke condensate or atmospheric pollutants. (Author summary)

05418

G. J. Stopps and R. McLaughlin

PSYCHOPHYSIOLOGICAL TESTING OF HUMAN SUBJECTS EXPOSED TO SOLVENT VAPORS. Am. Ind. Hyg. Assoc. J. 28 (1), 43-50 (Feb. 1967).

The purpose of the experiments reported here was to assemble tests sensitive enough to measure changes in psychophysiological functions in human subjects exposed to low concentrations of

solvent vapors. Four concentrations of trichloroethylene were studied, ranging from the 1965 threshold limit value of 100 ppm upward to 500 ppm. Results showed no significant effect of 100 ppm of trichloroethylene on psychomotor performance; however, there was a progressive decline in performance with increasing trichloroethylene levels at higher concentrations. Similar experiments were performed using Freon-113 (1,1,2-trichloro-1,2,2-trifluoroethane) in concentrations ranging from 1000 ppm to 4000 ppm. No significant effect of Freon-113 on psychomotor performance was seen at 1000 ppm, but slight deterioration appeared at 2500 ppm, and progressively higher concentrations resulted in an increasing decrement in performance. (author abstract)##

05639

G.W. Griffith

ATMOSPHERIC POLLUTION AND LUNG CANCER. Cancer Progr. 88-94, 1963.

Correlation between the incidence of lung cancer and the concentration of air pollutants in Wales, England, United States, U.S.S.R., Denmark, Norway and Iceland is presented, the air pollutant being 3,4-benzpyrene. The contribution of air pollution to mortality rates in urban and non-urban areas, smokers versus nonsmokers is discussed. It is concluded that removing the 'urban' factor in the five main cities of South Africa without alteration of smoking reduces the mortality in these cities by only ten percent.##

05640

Andur, H. O.

HAZARDS TO HEALTH (AIR POLLUTION AND HUMAN HEALTH-CHRONIC BIOLOGIC EFFECTS). New Engl. J. Med. 268, 555-6, Mar. 15, 1963.

The effects of air pollution as a respiratory ailment are reviewed. Pollutants found in urban atmospheres (sulfur dioxide, benz(a) pyrene, ozone and carcinogenic substances) are the principles discussed. It is conjectured that various irritants present in urban atmospheres may also enhance the potency of even very small amounts of carcinogenic substances. Some irritants decrease the rate of ciliary activity in the respiratory tract, thus interfering with one of the mechanisms that normally remove inhaled particulate matter from the airways, and chronic irritative damage to the epithelial lining of the airways could render it more susceptible to the action of carcinogens.

05641

H. H. Darley, J. T. Middleton, and M. J. Garber

PLANT DAMAGE AND EYE IRRITATION FROM OZONE-HYDROCARBON REACTIONS. Agr. Food Chem. 8 (6) 483-5, Dec. 1960. (Presented at the 138th Meeting, American Chemical Society, Atlantic City, N. J., Sept. 1960.)

gas phase reaction products of several ozone-hydrocarbon mixtures, including mono-olefins, a diolefin, and acetylene, were assessed for their relative ability to damage pinto bean plants and to irritate eyes. Plant damage was obtained from all reactions whose products, after cleavage at the double bond, contained three or more carbon atoms; ozone reactions with propylene and 2-butene produced no phytotoxicant. Injury was markedly reduced by attaching a methyl group at the double bond of a straight-chain olefin; however, there was no difference in injury between cis- and trans- forms of a given olefin. None of the reactions irritated eyes above that amount reported for clean, carbon-filtered air.##

05728

R. J. Johnson

SECONDARY ANEMIA AND SUSCEPTIBILITY TO HYDROCARBON COMBUSTION PRODUCTS (CASE REPORT). Ann Allergy 23, 148-50, Mar. 1965.

This case report presents data on an individual who demonstrated susceptibility to hydrocarbon fuel with its combustion products from a domestic gas furnace. This case also points out that the cause of a symptom-complex of weakness, fatigue, palpitation, faintness, etc., may not be an "either-or" situation, but can be caused by both the medical entity of anemia and the allergic entity of extreme susceptibility to the chemical environment; in this case, to hydrocarbon fuel. The intensity of patient's symptoms did not correlate with the degree of patient's anemia and tended to worsen as the winter wore on. They were dramatically alleviated by separating patient's from the airborne chemicals and recurred when she was re-exposed to hydrocarbon fuel in her home. Nevertheless, patient's anemia was not cured and patient's did not completely recover from the subjective symptoms until hysterectomy cured menorrhagia.##

05729

Rylin, B.; Hunegi, E.; and Viner, S.

HEPATOTOXICITY OF INHALED TRICHLOROETHYLENE AND TETRACHLOROETHYLENE LONG-TERM EXPOSURE. Acta Pharmacol. Toxicol. (Copenhagen) 22, 379-85, 1965.

The hepatotoxicity of trichloroethylene and tetrachloroethylene, was studied in mice subjected to long-term exposure by inhalation. Duration of exposure was four hours daily for six days a week over periods of one, two, four and eight weeks. Effects on the liver were evaluated by histological examination and determination of extractable liver fat. The most conspicuous histological change consisted of fatty degeneration. With trichloroethylene this lesion was slight even at a concentration of 1,600 ppm, but with tetrachloroethylene it was massive at as little as 200 ppm. Neither liver cell necrosis nor cirrhosis was discernible. On the basis of these findings the hygienic threshold for tetrachloroethylene is discussed. (Authors' summary)

05737

Mastromatteo, E.

RECENT OCCUPATIONAL HEALTH EXPERIENCES IN ONTARIO. J. Occupational Med. (Ottawa). (Presented at the American Industrial Health Conference, Hal Harbour, Fla., Apr. 1965.). 7(10):502-511, Oct. 1965.

Industrial exposure to several toxic agents is reviewed and case histories are given. Included are mercury exposure in chlor-alkali plants, electrical outdoor advertising, the hat industry, and the treating of grain seed with an organic mercurial fungicide; asbestos insulation and the manufacture of brake linings and clutch faces; exposure to toluene diisocyanate and a curing agent for isocyanate-containing polymers; furfuryl alcohol exposure; illness associated with urethane foam manufacture; and respiratory sensitization in a rubber industry.

05790

R. A. Young

HEALTH HAZARDS OF ELECTROPLATING. J. Occupational Med. (Ottawa) 7, (7) 348-52, July 1965.

In the electroplating industry, materials utilized, gases and vapors evolved, and procedures applied are such as to warrant concern with respect to personal injuries and occupational diseases. Offending agents characteristic of this industry are chromic acid and mineral acids; the metals cadmium, lead, nickel, and arsenic; and such gases and vapors as arsine, hydrogen, hydrocyanic, cyanide, and trichloroethylene. A continuing requirement in the operation of an electroplating plant is the avoidance of mixing acid and cyanide solutions. The disposal of some plating plants wastes may require special treatment prior to their discharge into public sewer systems. (Author summary modified)##

05819

Schuck, E. A. and N. A. Renzetti

EYE IRRITATIONS FORMED DURING PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN. (J. Air Pollution Control Assoc.) 10 (1), 389-92 (Oct. 1960). (Presented at the 53rd Annual Conference, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

Individual hydrocarbons were irradiated with near-ultraviolet light in the presence of nitrogen dioxide. Two products of the photooxidations, formaldehyde and acrolein, were found to be eye irritants and to account for the majority of the observed eye irritation found in the photooxidized systems studied. At the concentrations present in the photooxidized mixtures, epoxides, most aldehydes, ketones, nitrites, ketene, ozone, alkyl nitrates, and acyl nitrates were not eye irritants. Terminal olefins in general led to the greatest amounts of irritation. Internal olefins were of lesser importance in the formation of eye irritants in spite of their rapid rates of reaction. Saturates did not

contribute to eye irritation because of their slow rates of reaction. (Author summary modified)

05882

THE HEALTH HAZARDS OF COMMUNITY AIR POLLUTION. (Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, June 7, 1966.) 60 pp.

In testimony before the Senate Special Subcommittee on Air and Water Pollution on June 7, 1966, the Secretary of Health, Education, and Welfare said: "There is no doubt that air pollution is a contributing factor to the rising incidence of chronic respiratory diseases - lung cancer, emphysema, bronchitis, and asthma." This summary of the results of scientific studies of air pollution and human health provides documentation of the Secretary's statement. The topics covered are: lung cancer, chronic bronchitis (and associated respiratory diseases), effects on laboratory animals, radioactive materials, sulfur oxides, carbon monoxide, oxides of nitrogen and other facets of the ill effects of air pollution. There are one hundred sixty one (161) references.##

05949

G. I. Seinsin

HYGIENIC EVALUATION OF DINYL AS AN ATMOSPHERIC AIR POLLUTANT. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 88-92. (1962). Russ. (Tr.)

Results of odor perception study conducted with 15 persons indicated that the concentration of threshold dinyl vapor odor perception was 0.06 mg/cu.m. and that the concentration of threshold dinyl reflex effect on eye sensitivity to light was 0.04 mg/cu.m. The concentration of threshold dinyl electrocortical conditioned reflex formation was 0.03 mg/cu.m., and the subthreshold concentration was 0.01 mg/cu.m. The maximal single allowable dinyl vapor concentration for atmospheric air should not exceed 0.01 mg/cu.m. Dinyl concentrations of 10 and 0.2 mg/cu.m. under conditions of chronic vapor inhalation elicited changes in the succic antagonist's chronaxy in white rats. Rate of coproporphyrin elimination with the urine was lowered in rats which chronically inhaled 10 and 0.2 mg/cu.m. of dinyl vapor. Prolonged inhalation of air containing 10 mg/cu.m. of dinyl lowered cholinesterase activity, while inhalation of 0.2 mg/cu.m. under similar conditions enhanced cholinesterase activity; inhalation of air containing 10 and 0.2 mg/cu.m. by rats increased the number of leucocytes and decreased the number of lymphocytes. Chronic 24-hour inhalation by rats of air containing 0.01 mg/cu.m. of dinyl vapor for a period of 70 days had no effect on the rats' functional activities noted in rats inhaling air having higher dinyl vapor concentrations. The limit of average 24-hour dinyl vapor concentration in atmospheric air could be the same as the limit of maximal single concentration, i.e. 0.01 mg/cu.m. Sanitary clearance zones surrounding capronic plants which discharge up to 6 ton of dinyl per month should not be less than 800 m wide.##

08958

Shen, L.

EXPERIMENTAL DATA FOR THE HYGIENIC EVALUATION OF ATMOSPHERIC AIR POLLUTION WITH STYROL. (In: Limits of allowable concentrations of atmospheric pollutants, Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 155-68. (1963). Russ. (Tr.)

The results obtained from the hygienic evaluation of atmospheric styrol showed the following: (1) The concentration of threshold styrol vapor odor perception in most sensitive persons was 0.02 mg/cu.m, and the subthreshold non-perceptible concentration was 0.01 mg/cu.m.; (2) The threshold effect on reflex changes in eye sensitivity to light in response to styrol inhalation was the same as the threshold of odor perception, namely 0.02 mg/cu.m.; (3) The threshold styrol concentration capable of forming electrocortical reflexes was 0.002 mg/cu.m.; and (4) The recommended limit of allowable single styrol concentration in atmospheric air was 0.003 mg/cu.m. Rats exposed to continuous 70 days inhalation of air containing 50 and 0.05 mg/cu.m. of styrol vapor showed disturbed muscle antagonists chronaxy ratios, a lowered coproporphyrin elimination with the urine, enhanced blood cholinesterase activity, increased numbers of leucocytes and monocytes and reduced number of erythrocytes, also some histopathologic changes of the internal organs. Inhalation of air containing 0.003 mg/cu.m. of styrol under similar experimental conditions had no effect on any of the above mentioned indexes. Sanitary examination of the atmospheric air in the vicinity of a chemical plant producing polystyrol clearly indicated that styrol vapor air pollution extended over considerable distances from the plant and that only at 500 m from the source of pollution was the styrol concentration in the atmospheric air below the proposed limit of its allowable concentration.

06003

P. J. Lawther

BRONCHIAL CARCINOMA, AIR POLLUTION, SMOKING, AND LUNG CANCER. Trans. Med. Soc. London 81, 158-60 (1965).

In 1960 about 300 deaths in England and Wales were reported as being due to lung cancer; last year more than 26,000 people died of the disease in England. This dramatic rise in prevalence, though most regrettable, has furnished research persons with clues concerning the etiology of the disease and has made it possible to discard some unsatisfactory answers. There would seem to be good reason to blame urban air pollution for lung cancer but there are insurmountable objections to the complete acceptance of this hypothesis. However, a massive survey in the U. S. has revealed an urban/rural gradient in lung cancer mortality among non-smokers. This fact would indicate that an urban factor is operating but whether this is real or merely reflects the existence of better diagnostic facilities and greater clinical skill in towns has yet to be decided. Although the fumes of diesel engines have come under suspicion as a carcinogenic agent, there appears no sound evidence that populations exposed by virtue of occupation to more than average concentrations of petrol exhaust products suffer

especially from lung cancer. Also under suspicion are automotive exhausts from gasoline engines and various industrial emissions. It is suggested not to ignore such potent "new" carcinogens as asbestos or the possibility of synergism between air pollution and cigarette smoke and other co-carcinogens.##

06008

W. Lijinsky and P. Shubik

THE DESTRUCTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN LIQUID SMOKE AND SOME FOODS. Toxicol. Appl. Pharmacol. 7, (2) 137-43, Mar. 1965.

The present study was undertaken to investigate the possible occurrence of polycyclic aromatic hydrocarbons in a variety of materials commonly occurring in the environment of man. Clearly the investigation has concerned only a small part of the total problem. Since the use of liquid smoke is now superseding the ancient chimney method, it was thought desirable to investigate the polycyclic aromatic hydrocarbon content of liquid smoke and to determine whether any carcinogens were present that might enter the food treated with it. A sample of bacon (prepared in a smoke oven) was analyzed, in addition to smoked salmon and Icelandic smoked haddock. In view of the polycyclic aromatic hydrocarbons found in commercial solvents it was of interest to examine some oils and fats used as food, since solvents are commonly used in oil and fat processing. A sample of a vegetable oil and of a solid hydrogenated fat was examined. Finally, because polycyclic aromatic hydrocarbons occur in air pollutants, it is conceivable that some of these enter drinking water by falling into reservoirs. Lake Michigan is one such open source of drinking water, and a sample of this was analyzed for polycyclic aromatic hydrocarbons. The analyses of these materials involved variants of the analytical methods for polycyclic aromatic hydrocarbons in use for many years in these laboratories. The aromatic materials were concentrated by extraction and solvent partition, the polycyclic aromatic hydrocarbons were separated by chromatography and identified and estimated by absorption spectrometry. Polycyclic aromatic hydrocarbons were absent from the water and vegetable oils, but were present in bacon, smoked salmon, smoked haddock, and liquid smoke at concentrations of the order of parts per billion. Traces of the carcinogen benzo(a)pyrene were present in smoked salmon and smoked haddock, but no carcinogens were detected in bacon or in the two samples of liquid smoke examined.##

06017

B. A. Schneider, C. E. Schmidt, and J. P. Costilow

RELATION OF ODOR FLOW RATE AND DURATION OF STIMULUS INTENSITY NEEDED FOR PERCEPTION. J. Appl. Physiol. 21 (1), 10-4 (Jan. 1966). (Presented at the Annual Meeting, Federation of American Societies for Experimental Biology, Atlantic City, N. J., Apr. 10, 1965.)

To ascertain the influence stimulus flow rate and duration of olfactory perception of n-butane in nitrogen, thresholds were

measured in eight adults for 16 combinations of 4 flow rates (10, 20, 40, and 80 ml N2/sec) and 4 durations (0.25, 0.50, 1.00, and 2.00 sec). Expressed as total amount of odorant, thresholds were highest at the fastest flow rates and longest durations. Expressed as concentration of odor, thresholds were highest at the slowest flow rate and shortest durations. Analysis of variance showed that flow rate and duration separately and flow duration interaction significantly contributed to the observed variance. It was concluded that the critical condition for perception is that sufficient odor molecules strike the end organ within a given period of time and that this condition could be defined as a critical intranasal odor rate or as a critical intranasal concentration. (Author abstract)##

06099

B. J. Bryan

INSTRUMENTATION FOR AN AMBIENT AIR ANIMAL EXPOSURE PROJECT. J. Air Pollution Control Assoc. 13 (6), 254-59, June 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A comprehensive physiological study on the problem of air pollution from automobile exhaust was started by the University of Southern California under a contract with the U.S. Public Health Service. Several different types of experimental animals, including mice, rats, guinea pigs, and rabbits, were to be exposed at four separate locations in the Los Angeles Basin. In determining the possible biological effects of automobile-related air pollution on test animals, the planned studies included those for cancer, lung function, blood analysis, enzyme determinations, and tissue tests. The animals were divided into 2 groups, one being supplied untreated ambient air, and the other purified air for a control. All other environmental conditions were designed to be as nearly identical as possible. The design of facilities, including ambient air room ventilation and control room air purification systems, is discussed. In the design of facilities, the most important problem encountered was that of existing limitations on air purification systems. The experimental design concept used in this project called for no alteration of the breathing air provided to control animals except for the removal of air contaminants. It was not possible to provide such a system in which removal of CO, lower molecular weight hydrocarbons, and NO, could be accomplished effectively. Experience to date, however, indicates that the air purification system selected does remove O3, higher molecular weight hydrocarbons, NO2, and filterable black aerosols quite effectively. The conclusions to date are limited. However, it is concluded that additional design and evaluation projects are necessary in order to improve ventilation and air purification equipment design for environmental exposure projects.##

06163

G. T. Smith

SMOG - ITS ORIGIN. Rocky Mt. Med. J. 64, (3) 55-8, Mar. 1967

Volatile materials produced by vegetation may be responsible for smog as well as man-made products. It has been calculated that one billion tons of volatile organic substances (terpenes) are released per year by vegetation over the surface of the earth. Throughout the world the terpenes are present in the air at concentrations of 2 to 20 parts per billion. It has been postulated that the dissipation of terpenes passes through the same cycle as that of gasoline vapors in producing a pollution haze. These blue hazes are seen especially in the mountain and desert regions in the U.S. There is some evidence to suggest that these terpenes may be toxic. In Reno, Nevada there was a close correlation between the occurrence of asthma attacks and the concentration of terpenes in the air as determined by monitoring with a gas chromatograph. White rats exposed to 40-60 parts per million of alpha terpene became lethargic in 10 min. Symptoms progressed through agitation, staggering, and finally convulsions in [illegible] min with death in 30 min. At autopsy, the rats had focal ions of tracheal mucosa, pulmonary edema, and cerebral edema. The adult guinea pigs weighing more than the rats died on the first exposure in 35 to 45 min. The pilot study showed that alpha pinene is toxic in high concentrations to both humans and laboratory animals. The investigation is being continued to study the long term effects of lower concentrations found in nature to determine if pulmonary lesions are produced by prolonged exposure.#

08198

Hector, D. D., R. L. Steadman, R. A. Jones, and J. Siegel

EFFECTS ON EXPERIMENTAL ANIMALS OF LONG-TERM INHALATION EXPOSURES TO MINERAL SPIRITS. Toxicol. Appl. Pharmacol. 9(2):257-268, Sept. 1966. 10 refs.

A series of short-term repeated and long-term continuous inhalation studies were conducted with a widely used Navy paint thinner (mineral spirits) at concentrations ranging from 114 to 1153 mg/cu.m. Guinea pigs exposed continuously for 90 days to 363-1277 mg/cu.m. showed mortality rates ranging from 27 to 79%. Hematologic, biochemical, and pathological studies failed to reveal changes that might account for these deaths. On the basis of these studies a 90-day tentative guideline for submarines has been established at 40 mg/cu.m. for mineral spirits containing 15-20% aromatic hydrocarbons. (Authors' summary)

06219

J. H. Spencer

PESTICIDE POISONING: THE INSECTICIDES. S. Dakota J. Med. 20: (2) 25-9, Mar. 1967.

The purpose of this paper was not to present a comprehensive review of insecticide intoxication, but to emphasize that with prompt and adequate therapy, an uneventful recovery may be anticipated. The insecticides and especially the organic phosphates and the chlorinated hydrocarbons are highly toxic and frequently are the cause of poisoning in man and animals. With the large number of pesticides sold under a variety of trade names, the diversity of their toxicology, and the multiplicity of their symptoms, the physician may be confused when called upon to

diagnose a case of insecticide poisoning. The two classes of pesticides commonly involved in poisoning are organophosphates and the chlorinated hydrocarbons. The typical reaction of the organo-phosphates is an anticholinesterase action which with an early diagnosis can be treated by prompt administration of atropine and pralidoxime. The chlorinated hydrocarbons offer less hazard to man than the organophosphates. There are no specific antidotes for poisoning from the chlorinated hydrocarbon insecticides. The treatment is symptomatic and supportive. In addition to the actual treatment of the poisoning, the patient's exposure should be terminated and the attending personnel should be protected. In a well-ventilated area, ordinary surgical gloves should control the hazard. All contaminated clothing should be removed and the patient washed with generous amounts of soap and water to which washing or baking soda may be added. When recovery has been attained and no sequelae have been noted, the patients usually show no further complications.##

06266

B. H. Higdon

PULMONARY NEOPLASMS PRODUCED BY METHYLCHOLANTHRENE IN THE WHITE PEKIN DUCK. Cancer Res. 21(6), 871-4 (May 1961).
(Presented at the Pan-American Medical Association Meeting, Mexico City, May 2-11, 1960.)

Many neoplasms occurred in the respiratory tract of white Pekin ducks following one intratracheal injection of methylcholanthrene suspended in a 1.0% aqueous solution of polysorbate 80. No tumors occurred when only polysorbate was injected. The histologic type of the tumors varied. Some were neurofibromas, and others were ganglioneuromas, hemagiomas, squamous cell-like carcinomas, adenocarcinomas, whereas still others were unclassified types of neoplasms. Frequently a single tumor showed a variety of histologic patterns. No metastases occurred. The first tumor was found 56 days after the injection of the carcinogen. Fluorescence studies showed the distribution of methylcholanthrene in the respiratory tract. Methylcholanthrene crystals persisted in the tract for long periods. This technic appears to be very satisfactory for the production of neoplasms in the respiratory tract of the duck. (Author summary)##

06268

Shabad, L. M., L. M. Pylev, and T. S. Kolesnicheako

IMPORTANCE OF LOCAL RETENTION OF CARCINOGENIC AGENT IN PATHOGENESIS OF LUNG CANCER (EXPERIMENTAL INVESTIGATION). Federation Proc., Transl. Suppl. 24(5):T717-T720, Aug. 1965. (Translation of: Vopr. Onkol. (Moscow) (Problems of Oncology) 10, (6) 65-72, 1964.)

Experiments were designed to study the elimination from the lung of 3,4-benzpyrene with repeated administration of suspensions of varied composition. Use was made of 280 random-bred rats of both sexes (138 males and 142 females), aged about 3 months and weighing 80-100 g. The amount of benzpyrene detectable in the lungs 24 hr after a single administration of the substance in physiological saline was somewhat less than after administration of benzpyrene

with India ink and colloidal infusin. Three days after administration with India ink and colloidal infusin, the amount of benzpyrene retained in the lungs was nearly 12 times the amount remaining after administration in physiologic saline. After 5 days a difference was noted between the results of administration of benzpyrene with India ink and colloidal infusin and the administration of this substance with each of these ingredients separately. A distinct relationship is noted between repetition of administrations and the accumulation of benzpyrene in the lung. With repeated administrations, there is evidently further extension of inflammatory processes in the lung tissue, and the latter acquire a chronic character with corresponding exacerbations, which may be conducive to retention of the carcinogen in the lung tissue. Therefore the decisive factor in the retention of benzpyrene in the lung tissue is the nature, combination and, probably, the quantity of the absorbent factors. The greatest deposition of benzpyrene was seen following its administration with India ink and colloidal infusin jointly, whereas its administration with either of these ingredients separately or with physiologic saline did not achieve this end.##

06339

H. Honma and S. H. Kawasaki

THERMAL DEGRADATION OF POLYMERIC MATERIALS. II. TOXICITY EVALUATIONS OF SOME GASES EVOLVING FROM EPON 828 + LP 33 COMPOSITE POLYMER (TECHNICAL REPT.). Lockheed Aircraft Corp., Sunnyvale, Calif., Missile and Space Div. (1961). 38 pp. (Rept. LMSC-800694.)
CFSTI, DDC; AD 263270

A toxicological evaluation of SO_2, CO_2, and H_2S originating from the epoxy-polysulfide polymer is discussed in detail. The evaluation is further extended to a realistic case in which the laboratory data are extrapolated to 100 lb of polymer pyrolyzing at different temperatures (150, 250, 350, 450 C) into a constant air volume of 90,000 cubic feet. The concentration levels for these gases are shown at selected significant time intervals. Currently available threshold limit values for an 8-hour day are used for comparison in the assessment of the toxicity hazard. Based on the evaluation information, epoxy-polysulfide polymer does not present a hazard below 150 C. Sulfur dioxide and hydrogen sulfide become problematic at 250 C where a definite toxicological trend is established. Beyond this temperature the threshold limit values are rapidly exceeded by the sulfur gases, but carbon dioxide because of its high human tolerance presents only a marginal problem. Similar evaluations of the hydrocarbon gases (considered only hazardous and not toxic) are possible by calculations from the gas composition tables.##

06383

Epstein, S. S.

CARCINOGENICITY OF ORGANIC EXTRACTS OF ATMOSPHERIC POLLUTANTS. J. Air Pollution Control Assoc. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-81). 17(11):728-729, Nov. 1967.

The carcinogenicity of atmospheric pollutants can be demonstrated by chemical or biological methods. Chemical methods depend on the identification and measurement of known carcinogens, such as benzo[a]pyrene (BaP), in extracts of atmospheric pollutants. The value of chemical approaches is limited as various pollutant fractions, e.g., the oxyneutral or basic, contain undefined carcinogens; additionally, chemical techniques cannot predict the probability of in vivo interactions between various pollutant components or of enhanced carcinogenicity due to promoting agents such as phenols. Biological methods for demonstrating carcinogenicity are generally based on repeated skin painting or subcutaneous injection of pollutant extracts in mice. Marked variation in the carcinogenicity of organic extracts from various urban sites, incidentally with low activity in Los Angeles, has been noted. In addition to BaP, the role of other carcinogens in crude organic extracts is now generally accepted. Evidence for this includes, tumor production by BaP-free pollutants such as aliphatic aerosols of a synthetic assay and by aliphatic and oxygenated fractions of organic extracts, lack of parallelism between carcinogenicity of organic extracts and their BaP concentrations, and finally by the pattern and multiplicity of tumors developing following injection of pollutant extracts in infant mice. Recent indirect evidence, based on the photodynamic assay has incriminated di-alkylated benz[c]acridines and 7H-benz[de]-anthracene-7-one as the probable major polycyclic carcinogens in basic and oxygenated fractions, respectively. Definitive identification of organic carcinogens in atmospheric pollutants, inter alia, depends on the availability of adequate amounts of organic extracts, their fractions and sub-fractions. Approximately 10 kg of atmospheric particulates are required to produce a 10 g sample of the basic fraction, and in correlated chemical and biological investigations.##

06696

H. H. Wolfe, W. F. Durham, and J. F. Armstrong

HEALTH HAZARDS OF THE PESTICIDES ENDRIN AND DIELDRIN (HAZARDS IN SOME AGRICULTURAL USES IN THE PACIFIC NORTHWEST). Arch. Environ. Health 6 (4), 458-66 (Apr. 1963).

Studies were carried out to determine the health hazards associated with endrin and dieldrin, under conditions of some of their agricultural uses in the Pacific Northwest. Dermal exposure of spray-equipment operators was determined by exposing absorbent alpha-cellulose pads on various parts of their bodies for one or more complete cycles of spraying or dusting. Contamination of hands was measured either by rinsing in alcohol in a polyethylene bag or by swabbing with alcohol-impregnated gauze swabs. Respiratory exposure was estimated from the contamination of filter pads of respirators worn during pesticide application operations. The calculated exposure to endrin while dusting potato fields was 1.0% of a toxic dose per hour of exposure. While spraying endrin on orchard cover crops for mouse control, and while spraying dieldrin on pear orchards, the calculated exposure was only 0.2% and 0.1% of a toxic dose per hour, respectively, for each of the operations. Although these studies of acute exposure do not indicate that the workers studied were contaminated with amounts of endrin approaching the toxic level, the fact that the compound is stored in body fat must be taken into account in evaluating the hazard of repeated exposures. (Author summary modified)##

05600

Bilo, R. F. and J. C. Rusanovsky

ULTRASTRUCTURAL ALTERATIONS OF ALVEOLAR TISSUE OF MICE. II. SYNTHETIC PHOTOCHEMICAL SMOG. Arch. Environ. Health, 19(6): 844-850, June 1967. 15 refs.

The possibility of using artificial photochemical smog was investigated. Male A-strain mice were exposed for three hours to previously irradiated synthetic atmospheres which initially contained propylene, nitric oxide, carbon monoxide, and water vapor to simulate the oxidant concentration produced during a heavy smog peak. The lungs of these treated mice showed a pattern of ultrastructural alterations of alveolar tissue similar to that of tissues in heavy natural smog. Wall cell lamellar bodies generally increased in size and number in exposed 6-month-old mice, but only temporarily. Delaying death only 12 hours allowed the lungs to return to normal. Some permanent changes seemed to occur in exposed respiratory tissue of 15-month-old mice. Reasonably good recovery of smog-disrupted alveolar and capillary lining cells took place, but few wall cells remained. More extensive disorganization of wall cell cytoplasm and disruption of lining membranes occurred when the 20-month-old mice breathed the synthetic smog and delayed death allowed further damage and revealed cell debris in the alveoli. Since the synthetic smog produces cytological effects similar to the heavy Los Angeles smog, it may prove to be a useful tool in further studies concerning the effects of photochemical smog on biological systems.

06640

R. C. Battigelli, R. J. Hannelin, and T. F. Hatch

ENVIRONMENTAL AND CLINICAL INVESTIGATION OF WORKMEN EXPOSED TO DIESEL EXHAUST IN RAILROAD ENGINE HOUSES. Ind. Med. Surg., 33, 121-6 (Mar. 1964).

Within the limits of exposure to diesel exhaust products, of locomotive repairmen in three representative railroad engine houses over a period up to 15 years (average duration of 10 years), 210 workers (average age = 50 years) did not show any significant difference in pulmonary function performance from a group of 156 railroad yard workers (average age = 50 years) of comparable job status but without history of exposure to diesel exhaust products. Environmental studies in two engine houses revealed levels of exposure to several known constituents of diesel exhaust which were well within the tolerable limits of these substances considered as separate agents. These low values support the negative medical and physiological findings. In contrast, this investigation suggests higher frequency of respiratory complaints, physical examination of abnormalities of the chest, and decreased pulmonary function and performance of cigarette smokers compared to non-smokers regardless of occupation. (Authors' summary)**

05663

A. P. Rusinova

BENZENE AND ITS HOMOLOGUES AS POISONS IN ELECTRICAL WINDING AND INSULATION PLANTS . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 175-81, 1962. (Gigiena Truda i Prof. Zabolevaniya) 1, (1) 20-6, 1957 Translated from Russian.
OTSTI: 62-11103

The air of winding and insulation department of the plant investigated contained benzene and its homologues in concentrations exceeding the allowable limits. Most unfavorable operations were: application of adhesives to micanite or tubes manually and their loading into the drying ovens; insulation and lacquering of windings; brush coating of pole coils; and finally, washing and cleaning various finished products. Unsatisfactory labor conditions produced occupational poisoning with aromatic hydrocarbons among the women workers, with symptoms of typical blood picture changes and nervous system disturbances. A state of susceptibility occurred to some common non-occupational diseases, as was shown by increase in the morbidity of such diseases in women with toxic symptoms as compared with the control women.00

05680

Harry B. Elkins

SECRETORY AND BIOLOGIC THRESHOLD LIMITS. Am. Ind. Hyg. Assoc. J., 28(5):305-318, July-Aug. 1967. 27 refs.

"The industrial hygienist today recognizes that the peril incurred by the inhalation of harmful dust is a function of two variable factors - the degree of harmful exposure and the specific susceptibility of the exposed individual to ... injury." The preceding statement was made by Don Cummings in a paper published in 1938. The following year he repeated a suggestion he had discussed previously. "...it is also suggested that for each hazardous industrial dust two limiting concentrations should be established. The first, to be designated as the primary threshold, should express that concentration of dust in which a healthy man may be employed for a working lifetime without incurring a disabling injury. The second, to be designated as the secondary threshold, should express that concentration of dust in which a healthy man will inevitably contract silicosis if regularly employed for many years." Practically all industrial hygienists presently pay lip service to the principle stated in the first of these statements. The suggestion in the second statement has been only half adopted. Threshold limits, so-called, or under a different name, have been prepared for over 400 industrial hazards by various organizations in this country and abroad. There seems to be some confusion outside, if not within, the profession, however, over whether these values correspond to the primary or secondary limits. Certainly, when the observation that one of two workers can endure concentrations well above the Threshold Limit Value for a few months, without obvious ill effects, leads to the conclusion that the threshold limit is too low, it would seem that the observer has the secondary threshold in mind, rather than the primary one. The only biologic fluid finding such application for exposure tests is

blood; limited use has been made of biopsy specimens of lung, skin and fat, but these are not very practical for periodic sampling. The excretory products most frequently analyzed are urine and breath; sweat, the other major excretion product, is not well adapted for exposure tests.##

06710

J. Jagatic, H. E. Rubnits, H. C. Godwin, and H. W. Weinkopf

TISSUE RESPONSE TO INTRAPERITONEAL ASBESTOS WITH PRELIMINARY REPORT OF ACUTE TOXICITY OF ASBESTOS IN MICE. Preprint (1967).

The use of asbestos fibers exposed to a high temperature and injected into the experimental animals produced a high degree of toxicity, resulting in sixty per cent mortality. This experiment gives further support to the general concensus that asbestos produces fibrosis. Tissue in contact with asbestos needles not only produced fibrosis, but a special and peculiar type which is proliferative, granulomatous and invasive. It cannot be doubted that tissue behaves differently around asbestos fibers than it does around foreign body granulomas. It is not the intention of this article to theorize as to how or why asbestos powders produce fibroblastic proliferation or malignancies; these questions are under investigation, utilizing tissue culture techniques. The acute toxicity of heated asbestos observed was very unusual. There are still twenty mice under observation seven months after injection with the heated asbestos. After surviving the acute toxicity, these mice have recovered and are in good health.##

06820

G. F. Smith

TRICHLOROETHYLENE: A REVIEW. Brit. J. Ind. Med. (London) 23 (4), 249-62 (Oct. 1966).

The physical and chemical characteristics of trichloroethylene are reviewed in relation to its uses in industry and medical practice with special attention being paid to its metabolism, toxicity, and determination in air. Although the acute toxicity of trichloroethylene was recognised soon after it came into widespread industrial use chiefly by its effects on the central nervous system, the recognition of a possible chronic toxic effect characterised by a mild psycho-organic syndrome came much later and is still not universally accepted. The opinion that trichloroethylene is non-toxic has long since been abandoned in view of the increasing evidence to the contrary. The preponderance of opinion is against any serious toxic effect on the liver, although individual cases of liver damage in industrial workers have been reported. The sudden fatal collapse of young workers during mild exercise has been reported on rare occasions which generally involved heavy exposure. The most common method of determination involves the use of gas detector tubes. The other chemical and physical methods of determination are discussed. The maximum permissible levels for trichloroethylene in air were reduced from 600 ppm in 1947 to 200 ppm, and to 100 ppm in 1961. Effects on the hemopoietic system are rare as are reports on renal

damage. Air concentration as well as urinary metabolite levels are considered the best means of monitoring working conditions.##

06640

D. E. Rounds

THE EFFECT OF AIR POLLUTANTS ON CELLS IN VITRO. Preprint. (1966).

In this study the areas of investigation fell into three categories: (1) The effect of hydrocarbon mixtures on cells in tissue culture, (2) The effect of air pollutants on respiratory activity, and (3) Considerations of a vital constituent (surfactant) of the lung under normal and pathological or treated conditions. Since mitotic events are interrelated with the rate of increase of the total cell population, it was concluded that an evaluation of the effect of auto exhaust on cell number can provide a simple, reproducible, and sensitive test system for estimating the relative concentrations of physiologically active components of automobile emissions. It was observed that serial dilution of hydrocarbons stimulated the growth rate of human fetal lung cells and an established line of conjunctival elements in a linear fashion. Anaphase and telophase figures which resulted from a 24-hour treatment with 3'Me-DAB and air pollutants revealed a twofold increase in the incidence of bridged or lagging chromosomes. Time-lapse cinematographic records of the mitochondria of cells treated with ozone in culture revealed that these organoids undergo morphological alterations which suggested a loss of respiratory function of these cells. Oxygen depletion with time was proportional to the cell number with 250,000 to 500,000 control cells showing a decrease of 35 to 50 mm Hg of O2 pressure over a two-hour period. A careful comparison of mitochondrial images of alveolar wall cells, taken before and after treatment with 20 ppm NaNO2, suggested some degree of transformation of the filamentous morphology of the globular form. Studies on surface tension of mixtures of normal and oxygen poisoned lung extracts and studies using ultraviolet fluorescent microscopy, suggest that oxygen poisoning results in both absence of surfactant and presence of an inhibitor.##

06647

J. Cabilio

INSECTICIDAL COMPOUNDS (EFFECTS ON REPLICATION OF VACCINIA AND POLIO VIRUSES IN HUMAN CHANG-STRAIN LIVER CELLS). Arch. Environ. Health 14 (5), 698-702 (May 1967). (Presented at the 50th Annual Meeting, Federation of American Societies for Experimental Biology, Atlantic City, N.J., Apr. 14, 1966.)

Since virus replication is dependent upon the metabolism of host cells, the author postulated that some alterations in cell metabolism may influence the mechanism of viral biosynthesis. This possibility is supported by the previous observations that chronic exposure of cultivated cells to insecticides alters their susceptibility to diphtheria toxin and to poliovirus infection. To investigate the effects of insecticidal compounds on animal virus replication, six insecticidal compounds in human liver cells infected with vaccinia and poliovirus were tested. Insecticidal

compounds DDT, chlordane, dicofol, trichlorophon, malathion, and dinocap at subtoxic concentrations inhibited vaccinia virus replication in human Changestrain liver cells. Under the same experimental conditions, the replication of poliovirus was inhibited only by chlordane and malathion, whereas dicofol and dinocap increased the virus yields 4 and 18 times, respectively, and DDT exhibited a light stimulatory effect. Since the reduction in virus yields was not due to extracellular inactivation of virus, the results suggest that some insecticides exert an antiviral activity by altering some physiological activities of cells. Consequently, the magnitude of virus replication may be useful as a parameter for the detection of toxicity in insecticides and other chemicals below their acute toxicity levels.##

06869

M. L. Kramovitskaya, L. K. Maiyarova T. S. Zapotoshets

ATMOSPHERIC POLLUTION BY PETROLEUM REFINERIES AND PETROCHEMICAL PLANTS. (Zagryaznenie atmosfernogo vozdukha v rayone neftepererabatyvayushchego i neftekhimicheskogo predpriyatiya.) Hyg. Sanit. (Higiena i Sanit.) 30(4):118-121, Apr. 1965. Russ. (Tr.)

The nature of the atmospheric pollution in the area around a large petrochemical industrial complex was investigated and its effect on the health of children was studied. The pollutants are hydrocarbons, carbon monoxide, hydrogen sulfide, sulfur dioxide and chlorinated hydrocarbons. Three stationary observation points were established to examine the purity of air in the city: one point within the industrial complex, another 2.5 km away and a third 20 km from the plant. The concentration of atmospheric pollutants highest in the first district, a little lower in the second and even lower in the third. At the most distant observation point the atmospheric concentrations of CO and SO2 exceeded the maximum permissible levels. The content of harmful substances exceeded the maximum permissible concentrations in 51.2% of all the analyses. Studies of the records of first visits at children's clinics showed that, other conditions being equal, the incidence of influenza, upper respiratory tract infections, the common infections of childhood, and pneumonia, were higher in children residing in the area affected by the discharge, than in the control group, the difference being statistically significant. The children showed distinished immunobiological and redox reactions, as well as certain changes that are specific for petroleum gases, such as leucopenia, thrombocytopenia and hypotonia. A need for engineering improvements to reduce the industrial discharges from the oil refineries and petrochemical plants was demonstrated. One of the most important ways of combatting air pollution, which is still awaiting its engineering solution, is the extraction of sulfur from the raw materials and fuel used in the process of of petroleum refining. Another necessary measure is the prevention of loss of petroleum products by evaporation from storage tanks, by hermetically sealing the reservoirs against gas leaks, their thermal insulation, and the installation of the floating protective covers.##

06892

Tarkhova, L. P.

MATERIALS FOR DETERMINING THE MAXIMUM PERMISSIBLE CONCENTRATION OF CHLOROBENZOL IN ATMOSPHERIC AIR. ((Materialy k obosnovaniyu predel'no dopustimoi kontsentratsii khlorbenzola v atmosfernom vozdukhe.)) Hyg. Sanit. (Gigiena i Sanit.), 30(3):327-331, Mar. 1965. Translated from Russian.
CFSTI: TT 66-51033

According to the data in the literature, the toxicity of chlorobenzol is noted only in high concentrations. But there are no data on the content of this substance in atmospheric air, or on the action of small concentrations on man. The maximum permissible concentration of chlorobenzol in the atmospheric air of populated places has not been ascertained. The author undertook the present investigation in order to fill this gap. The threshold of olfactory perception of chlorobenzol is 0.5 mg/cu m for the most sensitive persons. The threshold of the action of this substance on the electric activity of the brain is 0.2 mg/cu m; the ineffective concentration is 0.1 mg/cu m. The maximum single-time permissible concentration of chlorobenzol lies at the level of 0.1 mg/cu m. Chlorobenzol in 1 mg/cu m concentration in the chronic treatment of white rats causes a lowering and distortion of the correct ratio of the chronaxia of the antagonist muscles, raises the cholinesterase activity and lowers the alpha-globulin content in the blood serum. Chlorobenzol in 0.1 mg/cu m concentration in chronic action on white rats does not cause the changes observed at a high concentration of that substance (1 mg/cu m). The average 24-hour maximum permissible chlorobenzol concentration may be at the level of the maximum single-time concentration (0.1 mg/cu m). (Author Summary modified)**

06893

T. Tulchakov

MAXIMUM PERMISSIBLE CONCENTRATION OF ETHYLENE OXIDE IN THE ATMOSPHERE. (Eksperimental'noe obosnovanie k gigienicheskomu normirovaniyu predel'no dopustimoi kontsentratsii okisi etilena v atmosfernom vozdukhe.) Hyg. Sanit. (Gigiena i Sanit.) 30 (10), 1-6 (Oct. 1965). Russ. (Tr.)

The maximum permissible one-time and mean-diurnal concentrations of ethylene oxide were determined. Twenty human subjects are used to determine the olfactory threshold. The olfactory threshold for ethylene oxide in 1.5 mg/cu m is the most highly sensitive individuals, the threshold for a change in the sensitivity of the eye to light is 1 mg/cu m, and the electrical activity of the cerebral cortex is affected at the level of 0.65 mg/cu m. The maximum one-time permissible concentration of the substance in the atmosphere is 0.2 mg/cu m. Prolonged round-the-clock poisoning of albino rats with ethylene oxide concentration of 0.3 mg/cu m for 60 days causes changes in the ratio of flexors and extensors as well as in the concentrations of chlorides and residual nitrogen in blood. The mean-diurnal maximum permissible concentration of ethylene oxide in the atmosphere is established at the level of 0.03 mg/cu m.**

06905

I. S. Gusev

REFLECTIVE EFFECTS OF MICROCONCENTRATIONS OF BENZENE, TOLUENE, XYLENE AND THEIR COMPARATIVE ASSESSMENT. (Reflektornoe deistvie mikrokontsentratsii benzola, toluola, i ksilola i ego sravnitel'naya otsenka.) Hyg. Sanit. (Gigiena i Sanit.) 30 (12), 331-6 (Dec. 1965). Russ. (Tr.)

The reflective effect on the electrical activity of the cerebral cortex of imperceptible concentrations of benzene, toluene, and xylene was investigated on highly sensitive individuals. The threshold concentrations of aromatic hydrocarbons decrease from benzene to xylene with respect to their effect on cerebral electric activity. The electric potentials are increased by benzene and toluene, while xylene has the opposite effect, causing a marked inhibition of the electric activity of the cerebral cortex. Concentrations of 1.5 mg/cu.m. benzene, 0.6 mg/cu.m. toluene, and 0.2 mg/cu.m. xylene are subliminal with respect to their effect on the electric activity of the cerebral cortex and imperceptible with respect to odor. These concentrations are recommended as the maximum permissible one-time atmospheric concentrations.00

06907

A. I. Kopanev

VITAL STAINING OF TISSUES IN ESTABLISHING STANDARDS OF ATMOSPHERIC POLLUTANTS. (Ob imprizovanii metoda vital'nogo okrashivaniya tkanei pri normirovanii atmosfernykh zagriaznenii.) Hyg. Sanit. (Gigiena i Sanit.) 30 (12) 190-1 (Dec. 1965). Russ. (Tr.)

The method of vital staining was used in order to study the functional state of the tissues of animals which had been exposed for a prolonged period to relatively low concentrations of ethyleneglycol vapor, and also to determine the effective threshold for this substance. Three groups of albino rats were continuously exposed to ethyleneglycol vapor concentrations of 75, 15, and 1 mg/cu.m. for 60 days, while the fourth group serves as the control. The accumulation index, the elimination index and the trophic potential are determined. The organs investigated are the liver, kidney, brain, lungs and spleen. In the first group 75 mg/cu.m.) a high accumulation index was found in the tissues of liver, kidneys, and brain; in the second group (15 mg/cu.m.) the increase in the absorption of the vital dye was less pronounced and was observed only in the liver tissues. Changes directed at compensating the disturbed functions are investigated by studies of the elimination index of vital dye. In the first group (75 mg/cu.m.) the elimination index is high in the lung and kidney and low in the liver; in the second group the elimination index is low in the liver and kidney. The group of animals exposed to the smallest investigated concentration of 1 mg/cu.m. did not exhibit any difference from the control group with respect to the indices of the accumulation and the elimination of the vital dye. Animals exposed to ethyleneglycol concentration of 75 mg/cu.m. exhibited a decrease in the trophic potential in lungs. The liver, brain and

spleen exhibited a significant increase in the trophic potentials pointing to increased activity of the appropriate cells. Animals treated with ethyleneglycol vapor concentration of 15 mg/cu.m. exhibit an increase of trophic potential in the liver, kidneys and spleen. Ethyleneglycol concentration of 3 mg/cu.m. causes no changes of the trophic potential in any organs of the animals, neither does it cause changes in any other indices of vital staining in comparison with the control group. This concentration of the substance also proved to be subliminal in its effect on the chronaxie of antagonistic muscles, acetylcholinesterase activity of blood and certain other tests. Vital staining of tissues is a sensitive method and deserves to be used when assessing hygienic standards for atmospheric pollutants.##

06910
R. G. Andur D. A. Cressatis

THE IRRITANT POTENCY OF N-TERPHENYL OF DIFFERENT PARTICLE SIZES. Am. Ind. Hyg. Assoc. J. 27, 349-52 (Aug. 1966.)

The effect of homogeneous aerosols of m-terphenyl of 0.30, 0.65, 1.0, and 2.0 microns diameter on pulmonary-flow resistance of unanesthetized guinea pigs was studied. At equal mass concentration the irritant potency increased as the particle size decreased and the number of particles increased. A small increase in mass concentration for the smaller particles produced a greater increment in response than occurred when the large particles were used. The results were in agreement with earlier work on aerosols of zinc ammonium sulfate. (Author abstract)##

06947

D. A. Hockensmith

AN EVALUATION OF THE THEORY OF CARCINOGENIC AROMATIC HYDROCARBONS. California Univ., Livermore, Lawrence Radiation Lab. (May 17, 1967). 27pp. (Rept. No. UCRL-50269.)

Several polynuclear aromatic hydrocarbons have been found to be carcinogenic. One of the most interesting is 9, 10-dimethylbenzanthracene, which causes sarcoma cancer in rats with essentially 100% effectiveness. The purpose of this investigation is to evaluate the theoretical explanation of this activity insofar as it has been developed. The three major points under consideration are the electronic properties of the carcinogens, the influence of steric factors, and the formation of charge transfer complexes. It is found that a qualitative theory can be put together but is by no means complete. The most reliable aspects of the aromatic hydrocarbon carcinogenesis theory are based on experimental rather than theoretical evidence. It was already known that the K region of anthracene was the most reactive part of that molecule. When the K region is blocked as in 9,4-benzpyrene and 9, 10-dimethylbenzanthracene, the K region is found experimentally to be the most reactive site. It is reasonable to assume even with no calculation that the reactivity of this region is due to the localization of pi electrons. The theory being evaluated here is primarily concerned

with the carcinogens and their mode of interaction with the unknown cellular receivers. It can be combined with other theories that specify the cellular receiver. For instance, the carcinogen could form a complex with a protein moiety of the cellular membrane. Or a virus in an inactive state could be activated by the interaction of a carcinogen with the virus nucleic acid. Even though the theory is not well confirmed at present, the approaches tried have been valuable in sharpening the concepts involved and in providing an interpretation of the experimental results as well as suggesting additional experiments. Appended: the Hückel approximation theory and electronic indices of the K and L regions of the aromatic hydrocarbons.##

07026

A. Morgan, D. J. Morgan, G. B. Arkell

A STUDY OF THE RETENTION AND SUBSEQUENT METABOLISM OF INHALED METHYL IODIDE. Proc. Intern. Symp. Inhaled Particles Vapours II, Cambridge, England, 1965. p. 109-120, 1967.

Radioiodine released from irradiated uranium is predominately in the elemental form, but a small amount is usually released as methyl iodide. To enable estimates of the radiological hazard resulting from the inhalation of radioactive methyl iodide to be made, measurements of its retention in a number of volunteer subjects were carried out using iodine-131 labelled methyl iodide. At normal breathing rates, the retention varies from 51 to 92% depending principally upon the respiratory rate (breaths per minute); low rates corresponding to high retention and vice versa. The mean value for retention is 72%. Studies of the clearance of radioactive methyl iodide from the lung, showed that its uptake into pulmonary blood and removal to other parts of the of the body in the general circulation is extremely rapid. The metabolism of iodine-131 introduced as methyl iodide was found to be very similar to that observed after oral intake of iodine-131 as inorganic iodide. It may be concluded that the retained methyl iodide is broken down quite rapidly and that the liberated iodide participates in normal iodine metabolism. Auth

07027

G. Altshuler, E. D. Palmes, N. Nelson

REGIONAL AEROSOL DEPOSITION IN THE HUMAN RESPIRATORY TRACT. In: Inhaled Particles and Vapours II. (Proc. Intern. Symp. Brit. Occupational Hyg. Soc., Cambridge, England, Sept. 28-Oct. 1, 1965.) C. N. Davies (ed.), London, Pergamon Press, 1967, p. 121-137. 20 refs.

Regional deposition of aerosol in the human respiratory tract is estimated from experiments in which aerosol concentration and respiratory flow were measured continuously during individual breaths and from a theoretical analogy with a tubular continuous filter bed model of the respiratory tract. Since the volume of anatomic dead space is uncertain, regional distinction is made by selected boundary volumes which separate the upper tract of the selected volume from the more distal lower tract. The central feature of the estimation procedure is the determination of a combined upper tract penetration, for inspiration, pause, and

respiration, derived from expired aerosol concentration corrected for aerosol sizing. The estimations indicate the particle size for maximum alveolar deposition is greater than 2 microns, equivalent diameter of a unit density sphere. This result is consistent with the calculations of Findeisen, Landahl, and Beechmann and higher than the 1 micron of Brown et al. (Authors' abstract)##

07068

B. Nieuwenhuis, L. Schaal, R. Strasser, and R. Rillens

TOXICITY OF CHRONIC LOW LEVEL EXPOSURES TO TOLUENE DIISOCYANATE IN ANIMALS. Am. Ind. Hyg. Assoc. J., 26 (2), 143-9 (Apr. 1965).

Toluene diisocyanate (TDI) is one of the important ingredients in the manufacture of lacquers, fibers and polyurethane foam plastics. The production and consumption of these products has increased greatly in recent years. TDI is known to have an irritating effect upon the skin, eyes, gastrointestinal tract and respiratory tract. Its Threshold Limit Value formerly established at 0.1 ppm has been lowered to 0.02 ppm; however, the Maximal Allowable Concentration level remains 0.1 ppm. The toxicity of repeated inhalation exposures to 0.1 ppm of toluene diisocyanate was studied in rats, rabbits and guinea pigs. The experiment consisted of two parts: (1) 38 six-hour weekly exposures on rabbits and rats, and (2) 58 six-hour daily exposures on rabbits, rats and guinea pigs. The development of bronchiolitis fibrosa obliterans in rats is the complication of primary interest. A description and illustrations of the lesion are given. Other biological effects of toluene diisocyanate are discussed. (Authors' introduction, modified)##

07159

Fisher, J. R.

THE PROBLEM OF CANCER IN NEW ZEALAND. New Zealand Med. J. Vol. 63:788-799, Dec. 1964

In considering the problem of cancer in New Zealand clinical features are not discussed in detail, but a general view of the situation is presented. The subject is discussed as follows: 1. The problem in New Zealand as shown by mortality returns, with some comparisons with other countries. 2. Action taken in the past to meet the position. 3. Recommendations. In 1961, the last year for which statistics are available, there were 3,572 deaths from cancer, about one-sixth of the total number of deaths registered in New Zealand in that year. These figures include Maoris, but in the more detailed figures and comparisons include, the reference is to Europeans only. This number of cancer deaths is the highest total ever registered here in one year, an increase of 202 over the previous year. The death rate per 10,000 of the population is also a record, being 14.72, as compared to 11.86 in 1960. Deaths due to cancer, according to sex, at 15 major sites, in New Zealand in 1961 are tabulated.##

07161

N. C. Delarue

RECONSIDERATION OF SOME SIGNIFICANT ASPECTS OF THE CIGARETTE SMOKING - LUNG CANCER CONTROVERSY. Can. Med. Assoc. J. (Toronto) 89, 1277-83. (Dec. 21, 1963). (Presented at a sectional meeting, American Coll. of Surgeons. Toronto, Canada, Apr. 25, 1963.)

The five-stage procedure used in the assessment of epidemiological evidence for the verification of assumptions drawn from observations about the characteristics of human disease incidence is as follows: First, retrospective and prospective studies are undertaken to define the nature of the specific problem. Later, in subsequent steps, the responsible agent is isolated and if possible eliminated. The hypothesis underlying these studies is then tested by a further prospective study if the injurious agent has been removed from the vehicle to be tested. In line with this procedure it was hoped that a single carcinogen could be identified and recovered from cigarette smoke and, on the elimination of this agent, a safe cigarette could be produced, tested and provided for public consumption. Unfortunately, the complex interrelationships of carcinogens and co-carcinogens seem to make the attainment of this ideal, the safe cigarette, remote indeed. The cigarette manufacturer faces a Herculean task in eliminating all of the various agents of this nature while maintaining a cigarette with aroma and flavour. If such an ideal solution cannot be reached and if no dramatic improvements in therapy are discovered, no alternative remains but to pursue as vigorously as possible every available means to curtail the cigarette smoking habit. (Author conclusion)##

07162

E. G. Ferris, Jr. and H. R. Frank

AIR POLLUTION AND DISEASE. Anesthesiology 25(4):470-478 Aug. 1964.

Atmospheric pollution can be classified under three headings: general, occupational and personal. The components are complex and variable so that it is difficult to extrapolate the prevalence of disease in one area to that of another unless the two have similar chemical compositions. Significant exposures can occur at work and may produce impairment of respiratory function. It is emphasized that tobacco smoking, and particularly cigarette smoking, is a most important factor in the causation of chronic nonspecific respiratory disease. Much research has been done to elucidate the mechanisms whereby such changes are induced but specific answers concerning the mechanisms have not been forthcoming. Tables are included showing types of atmospheric pollution; comparison of Los Angeles and London types of pollution; categories of airborne materials with selected examples that may occur in industry and that may cause disease; age standardized rates of respiratory diseases by tobacco usage and sex; age standardized rates (%) of respiratory disease by current cigarette smoking habits and sex.##

07165

W. I. Gleas and H. G. Thos

RESPIRATORY HAZARDS ASSOCIATED WITH TOLUENE DI-ISOCYANATE IN POLY-URETHANE FOAM PRODUCTION. New Zealand Med. J. (Toronto), Vol. 63, 842-847 (Oct. 1964).

Three plants engaged in the production of poly-urethane foam were visited. Air samples were taken at different stages of production and considered in relation to symptoms recorded from workers who had been or were affected. It is suggested that a maximum allowable concentration of toluene di-isocyanate in air of less than 0.01 ppm for the unprotected worker would lead to the appearance of few if any cases of illness in previously unexposed workers. The clinical pattern of the symptoms of the nine cases is discussed. Symptoms developed among different workers at different times after first beginning work with the compounds. The severity of the symptoms varied from slight dryness of the throat to a severe asthmatic type illness. The sequelae varied from the development of tolerance or of hypersensitivity, to the worker who remained unaffected or who was affected to a mild extent but whose condition did not deteriorate. (Authors' summary)##

07251

TOLERABLE LIMITS FOR TOXIC MATERIALS IN INDUSTRY. DIVERGENCES AND POINTS OF AGREEMENT AT THE INTERNATIONAL LEVEL. (I) ((Les limites tolerables pour les substances toxiques dans l'industrie divergences et points d'accord a l'echelle internationale. (I))) ((Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris))), 26((1-2)):41-56, Feb. 1965. Text in French.

The report of the International Committee on the Study of Tolerable Limits presented to the XIV International Symposium on Maximum Tolerable Concentrations of Toxic Materials in Industry held in Paris in 1963, which are given, represent a summary of the present knowledge on maximum allowable concentrations. The chief difficulty in establishing international standards involves the widely different views of the concept of tolerable limits and the methodologies of the U.S. and Russia. The study of the effects of many toxic materials on the central nervous system by Russian workers has led to the establishment of standards that are much more rigid than the U.S. standards for many materials. The Russian and U.S. limits for some toxic materials in mg/cu m, respectively are: ethylene oxide 1 and 90; chlordane 0.01 and 2.0; carbon tetrachloride 20 and 160. For 38 gases and 8 dusts, fumes, and mists, the Soviet standards are at least one fifth of the U.S. limits and in most cases even less. Some workers object to the methods used by the Russian experts on the grounds that they are too sensitive and show physiological rather than pathological effects. Because of the differences in concepts, the objective approach should be a discussion of the interpretation of the results obtained by both groups to understand and reconcile the different approaches. Fortunately, there are 21 gases and vapors and 19 dusts, fumes, and mists in which there is practical agreement and which can serve as a core for international standards which can be amplified with

an exchange of information and results. There is a necessity for further research to obtain data to permit the establishment of zones of tolerable concentrations rather than rigorous limits.##

07270

Advisory Committee on Tetraethyl Lead, Washington, D. C.

PUBLIC HEALTH ASPECTS OF INCREASING TETRAETHYL LEAD CONTENT IN MOTOR FUEL. ((Public Health Service, Washington, D. C.; Occupational Health Program.)) PHS Publ. no. 712, 89p.; 1959. 7 refs.
GPO: 526258-59-2

The advice of the Public Health Service was sought on increasing the maximum concentration of tetraethyl lead (TEL) in auto gasoline from 3.0 to 4.0 cc per gallon. An ad hoc committee was appointed to determine whether the proposed increase represented a public health hazard. Data on technical reasons for the increase, the results of research, the consumption of TEL by year, and a review of the medical problems are presented by the Ethyl Corp. Representatives of the duPont Co. supplied production figures, and information on actual and estimated TEL demand on U. S. producers. The Committee concluded that (1) a change in the maximum concentration of tetraethyl lead in motor fuel from 3.0 to 4.0 cc, would not increase the hazards involved in the manufacture and distribution of leaded gasoline and (2) available data do not indicate that such change would significantly increase the hazard to public health from air pollution.##

07291

Guseinov, B. P., F. D. Mashbits, and L. A. Shabad

A STUDY OF THE BLASTOMOGENIC PROPERTIES OF SOOT TARS DERIVED FROM ATMOSPHERIC DUST AND FROM COMBUSTION PRODUCTS OF DIFFERENT FUEL TYPES. Text in Russian. Gigiena i Sanit., No. 10:12-16, 1954. 3 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 79-80, March 1960.
CFSTI TT60-21188

A study was conducted of the blastomogenic properties of some tarry substances, particularly of the products of combustion of various types of fuel, such as coal, wood, peat, oil and its by-products, as well as of substances isolated from atmospheric dust. Samples were collected either by sedimentation or by aspiration and CC57 mice 2 - 3 months old were used as the experimental animals. The fur was removed from the skin between the shoulder blades and 10% benzene solution of the tar under study was applied to the exposed skin section about three times a week. The reactions observed were recorded up to the time of the death of the test animals. After that, and following autopsies, all tumors discovered were examined histologically. The data obtained strengthens the belief that the number of malignant tumors which developed in mice subjected to the applications of different tars, is to some extent related to the amount of 3,4-benzpyrene contained in the tars. Furthermore, on the basis of the results of experiments with test animals and of the spectral-fluorescence

analysis of atmospheric pollutants, it can be stated that 3,4-benzpyrene, a carcinogenic substance, is present in the air of certain towns. ASM##

07301

Shabad, L. M.

THE PRESENCE OF CARCINOGENIC SUBSTANCES, AND OF 3,4-BENZPYRENE IN PARTICULAR, IN THE ENVIRONMENT OF MAN. Vopr. Onkol., 5(3):271-275, 1959. 35 refs. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol 2, p. 141-146, March 1960.
OTSTI: PTS0-21188

The ability to produce experimental tumors in different organs and tissues by blastomogenic substances, presented the opportunity to make a detailed study of the origin and development of blastomata. Results of numerous experiments on the development of a variety of cancers carried out in the laboratory of the Institute of Oncology in Leningrad by a number of investigators indicated that four distinct phases were distinguishable in the development of all cancers. I. Irregular diffuse pretumor hyperplasia. II. Focal proliferations, the precancer stage proper. III. The so-called benign tumors. IV. Malignant so-called benign tumors. IV. Malignant tumors. Although the morphological changes may be different in different organs and may depend on a number of contributing factors, the basic characteristics of the process were identical in all cases. The enumerated states of development progressed from one into another without sharp demarcation; the development may become temporarily arrested at any one of the phases, or the arrest may become permanent and not attain the cancer phase. Tumors acquire specific cancer characteristics gradually in the process of development. This applies not only to the morphological characteristics, but also to the pathophysiological, biochemical and immunological characteristics. The mechanisms of the action of blastomogenic substances are unique and differ from the mechanisms of action of most stimulating agents. For instance, carcinogenic hydrocarbons suppress the inflammation and distort the course of the inflammatory reaction. The aforesaid illustrates that the study of carcinogenic substances considerably broadened the concept of the etiology and pathogenesis of malignant tumors and points to the means for their prevention in the following two ways: 1) early diagnosis and elimination of a precancerous condition, and 2) prevention of tumor formation by clearing the environment of carcinogenic agents.##

07302

Nisonova, A. V.

A STUDY OF THE POSSIBLE BLASTOMOGENIC PROPERTIES OF SOME SUBSTANCES RESULTING FROM THE PRODUCTION OF SYNTHETIC LIQUID FUEL. Vopr. Onkol., 5(5):534-539, 1959. 5 refs. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 147-155, March 1960.
OTSTI: PT 60-21188

Mice were tested with the primary and finished products of the manufacture of synthetic liquid fuel. A total of 580 two-month old mice were used in the experiment, using from 40 to 50 animals for each sample. One small drop of the test material was applied twice a week to the interscapular area of the mice. After the third or fourth application alopecia of varying degree developed in the majority of the animals. In the mice treated with the primary products the alopecia was extensive, the skin was hard, crusty and cracked. Simultaneous falling out of the old and the appearance of new fur was observed throughout the period of application of the test substances. Treatment of the skin with the final synthetic product produced limited alopecia. The tests consisted of 50 applications, after which the mice were kept under careful observation up to the time of their natural death. The dead animals were preserved in 10% formaldehyde and histologic examinations made of sections of the skin parts to which the test substances were applied and of pathologically affected organs. Four of the five primary products tested caused skin cancer development at the site of application in 12 to 18% of the mice; this justifies the conclusion that the substances possessed mild, but definite carcinogenic properties. Among the seven final synthetic products of hydrogenation, two manifested slight blastomogenic properties; no carcinogenic properties were detected in five products of this group. The conclusion regarding positive carcinogenic properties possessed by two primary materials, namely, the heavy tar and the gasoil from direct distillation, originally arrived at on the basis of 3,4-benzpyrene presence in these products, as indicated by fluorescentspectral analysis, was confirmed by the results of tests with animals. The biological tests also established the blastomogenic properties of four additional substances which gave negative fluorescent-spectral tests, indicating that carcinogenic substances other than those which yield a positive 3,4-benzpyrene test may be present in the substances investigated.##

07306

Novikov, Yu. V.

EFFECT OF SMALL BENZENE CONCENTRATIONS ON HIGHER NERVOUS ACTIVITY OF ANIMALS IN CHRONIC EXPERIMENTS. Gig. Sanit., No. 2:20-25, 1956. 4 refs. Translated from Russian by H. S. Levine, U. S. S. R. Lit. on Air Pollut. & Relat. Occup. Dis., VOL. 2, P. 185-191, MARCH 1960.
CFSTI TT60-21186

Groups of three types of conditioned reflexes were developed in mice: two positive, (one strong and one weak), and one negative. The group pattern was as follows: 2 positive conditioned reflexes in response to a bell (strong); 2 positive conditioned reflexes in response to a red light (weak); 1 positive conditioned reflex in response to a bell (strong); 1 negative conditioned reflex in response to a buzzer; two positive conditioned reflexes in response to a bell and 2 positive in response to a red light. After this pattern of motor conditioned reflexes had been established tests were made to determine the animal's type of higher nervous activity by extending differentiation to 3 min. and by testing the effects of 24 hour starvation. The average length of latent period of the second and third conditioned reflexes to bell ringing was thus calculated; first and second reflexes to red light stimulation and average length of conditioned motor

nutritional reflex reaction were calculated covering a period of ten days. The data thus obtained served as reference points for the evaluation of further changes in the conditioned reflex activity of the experimental animals. After having determined the typological characteristics of the rats' higher nervous activity animals were separated into groups according to higher nervous activity types. Final test groups contained rats of every neurotype. Chronic exposure to 64 mg/cu m of benzene vapor concentration produced functional changes in conditioned reflex activity of white rats. The changes were most marked in animals of weak and strong unbalanced type of higher nervous activi animals of weak and strong unbalanced type of higher nervous activity. In chronic intoxication with 13 mg/cu m of benzene vapor no changes occurred in the activity of the cerebral cortex. Results presented can serve as physiological basis for the adoption of the limit of allowable benzene concentration in atmospheric air.##

07308

Roslova, T. A.

THE EFFECT OF BENZENE ON THE ORGANISM AT HIGH AIR TEMPERATURE. Gigiena i Sanit., 22(4):18-24, 1957. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 196-201, March 1960.
CFSTI TT60-21188

The study was conducted over the years of 1953 - 1955 along two channels: direct observations in a leatherette factory (the Rogin plant), and experimental studies with laboratory animals. Observations under direct factory conditions were conducted during the months of June, July and August, when the temperature inside the work shops ranged between 28 - 42, and again during the months of December, January and February when the air temperature of the work shops ranged between 26 - 28. The control group consisted of individuals who lived under local climatic conditions free from benzene air pollution. The study covered blood pictures of 271 workers. The results showed that during the summer months, when the effect of benzene vapor on the workers was paralleled by high atmospheric temperature, the number of workers having anemias of moderate intensity increased (Hb, by Sahli hemoglobinometer was 75% and erythrocyte count below 4,000,000/cu mm). The number of workers showing signs of early leucopenia, with leucocytes below 5,000/cu mm also increased. In some workers the number of leucocytes fell during the summer months to 3,000 and of thrombocytes to 0,000/cu mm, pointing to the onset of a chronic state of benzene intoxication of I degree. The increase in benzene toxicity with increase in air temperature may have been due to the effect which increased temperature exerted on the rate of benzene permeation into tissues, its distribution rate and rate of toxicity neutralization by the organism and effect of temperature on the functional state of the nervous system (hyperthermic effect). The simultaneous exposure of animals to benzene vapor and elevated air temperature brought about a lowering in the resistance of the animal to temperature effects as indicated by increased disturbance in the processes of thermoregulation. There arises the possible need to determine differential limits of allowable benzene vapor concentrations in the air of industrial work rooms. This may apply equally to other gaseous air pollutants.##

07316

Alekseyev, A. Ye.

THE CENTRAL NERVOUS SYSTEM AND THE PHARMACO-DYNAMICS OF SOME VAPOR FORMING SUBSTANCES INHALED WITH THE AIR. Farmakol. Toxikologiya, 18(6):22-24, 1955. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 251-254, March 1960.
CFSTI TT60-21188

A study was conducted to determine whether the CNS plays an important role in the penetration of pharmacological agents through the alveolar membrane. Frogs were used as cold-blooded and white rats as warm-blooded animals. The study was made by the method of heart-lung preparation retaining its connection with the central nervous system; therefore, the method can be described as the heart-lung-brain-preparation method. The frogs were anesthetized and the thoracic cavity opened; blood vessels were ligatured in the following order: both cutaneous arteries, then both basal arteries, inferior vena cava and subclavian veins. In this way the pulmonary and carotid arteries and the internal and external jugular veins and the pulmonary veins remained open; through them blood was supplied to the brain via a small circuit. The posterior part of the frog's body was severed between the thoracic and lumbar vertebraw. A tube was then inserted into the trachea connecting the latter with a device for artificial respiration; heart contractions were registered kymographically. When a frog woke from narcosis, as was indicated by the appearance of protective reflexes in the eye or skin in response to needle prick, the administration of the test substances was begun. An intact frog served as control and its heart action was registered. Tests were made with chloroform, formalin, and paraldehyde. It was demonstrated that the central nervous system played an important part in regulating and directing lung membrane function. Severing the connection between the lung membrane and the central nervous system substantially affected the pharmaco-dynamics of some vapor forming pharmacological substances inhaled with the air. Volatile narcotics such as chloroform, and vapor forming substances such as paraldehyde freely permeated through the lung membrane which changed their pharmaco-dynamic effects when the connection between the lungs and the central nervous system remained intact.##

07332

F. Sperling, W. L. Marcus, C. Collins

ACUTE EFFECTS OF TURPENTINE VAPOR ON RATS AND MICE. Toxicol. Appl. Pharmacol., 10(1):10-20, Jan. 1967. 16 refs. (Portions of this paper were presented at the Second Int. Pharmacol Congr., Prague, Czech., Aug. 20-23, 1963, and at the Third, Fourth, and Fifth Annual Meetings, Soc. of Toxicol., Williamsburg, Va.)

The use of a small, inexpensive, dynamic inhalation system to determine the 2-hr LC50 for mice and the 1, 2, 3, and 6-hr LC50 for rats exposed to turpentine is described. The mice and rats were placed in individual glass cylinders which are so sized that the animals could move back and forth and rotate on their long axis, but could not turn around. The turpentine

vapor was obtained by pumping air through a wash bottle containing turpentine. A parallel system supplied air alone and by rotameters, the concentration in the exposure chamber could be varied from zero to saturation. The LC50 of turpentine vapor for rats for 1 to 6 hr of exposure ranged from 20 mg/liter to 12 mg/liter. The 2-hr LC50 for mice was 39 mg/liter. Exposure to the vapor caused an increase in respiratory rate, a decrease in tidal volume, and no change in the minute volume in rats. No evidence was found of pulmonary lesions induced by turpentine. Tissue distribution of turpentine in rats following exposure showed that the brain and spleen had the highest concentrations immediately after exposure as well as 60 min after exposure.##

07340

U. Saffiotti, R. Montesano, A. R. Sellakumar, S. A. Borg

EXPERIMENTAL CANCER OF THE LUNG. INHIBITION BY VITAMIN A OF THE INDUCTION OF TRACHEOBRONCHIAL SQUAMOUS METAPLASIA AND SQUAMOUS CELL TUMORS. Cancer, 20(5):857-864, May 1967. 16 refs. (Presented at the 9th Int. Cancer Congr., Tokyo, Oct. 1966.)

The purpose of this investigation was to explore the mechanisms controlling the initial metaplastic change in the response of the tracheobronchial mucosa to carcinogens using vitamin A as a tool to investigate the role of cellular differentiation in the pathogenesis of tumors derived from the bronchial mucosa. Two groups of Syrian golden hamsters, each containing 36 males and 36 females received 10 intratracheal installations of 3 mg. of benzo(a)pyrene (BP) and 3 mg of hematite suspended in saline given once weekly. One group received stomach tube feedings of vitamin A palmitate (5 mg or 5,000 IU in 0.1 ml of corn oil) twice weekly for life beginning one week after the end of the BP treatment. In the group receiving no vitamin A, there were 19 cases of squamous tumors and 13 cases of squamous metaplasia in 53 animals at risk. In the group receiving vitamin A, one developed a microscopic squamous tumor in a bronchus and one developed a patch of squamous metaplasia in the trachea among 46 animals at risk. There was a marked reduction of forestomach papillomas among the vitamin A group. It is indicated that vitamin A administered following a carcinogenic exposure to the respiratory tract to benzo(a)pyrene can interfere with the induction of squamous metaplasia and squamous tumors in the tracheobronchial mucosa.##

07342

C. W. Elston

PNEUMONIA DUE TO LIQUID PARAFFIN: WITH CHEMICAL ANALYSIS. Arch. Diseases Childhood (London), 41(218):428-434, Aug 1966. 19 refs.

A case of liquid paraffin pneumonia is reported in an infant with congenital abnormalities and a method of extraction and identification of the oil is included. In most of the cases recorded since the first description of oil aspiration pneumonia in man by Laughlen in 1925, the diagnosis was made

on purely histologic grounds. In this fatal case of lipid pneumonia due to inhalation of liquid paraffin in an infant who had a congenital oesophageal atresia repaired 24 hours after birth, identification of the oil was not possible by histological or histochemical means. After the material was extracted with petroleum ether and purified by chromatography, it was identified as liquid paraffin by its refractive index and infrared spectrum. The administration of liquid paraffin to infants, especially those with feeding difficulty is potentially dangerous. In adults, the physical condition plays a part in determining the degree of lung involvement. In debilitated patients there is a tendency to develop a generalized lipid pneumonia, whereas, a person in good general health is more likely to develop a localized granuloma.##

07352

Iizuka, Y.

TOXICOLOGICAL AND HYGIENIC STUDIES ON DIELDRIN. (REPT. 1. BIOASSAY OF DIELDRIN BY USE OF LARVAE OF ORTHOCLADIUS AKAMUSHI, TOKUNAGA. REPT. 2. EXTRACTION OF DIELDRIN FROM MOTH-PROOFED KNITTING YARN BY HUMAN SALIVA AND ITS HYGIENIC SIGNIFICANCE. REPT. 3. DIELDRIN CONCENTRATION IN AIR IN MOTH-PROOF PROCESSING.) Text in Japanese. Japan J. Ind. Health (Tokyo), 5(8):531-541, Aug. 1963. 24 refs.

Dieldrin (chemical abbreviation, HHDD) is widely applied as an insecticide in agriculture, and for vector control and recently as a moth-proofing agent for knitting yarn. The author devised a simple bioassay method of dieldrin using larvae of Orthocladius akamushi Tokunaga which is sold on the market as fish feed throughout the year. By aid of this micro-determination method, the author investigated the possible hazard to babies by chewing a moth-proofed woolen dress. It was concluded that some account of dieldrin, which adheres to the surface of yarn, will be readily dissolved by saliva while the remaining portion (70% or more) is firmly fixed to the wool protein. The magnitude of extracted dieldrin by saliva (0.4 mg from three grams of knitting yarn) is far beyond the estimated toxic doses for babies and infants (1 mg/kg), but the washing by detergent after the moth-proofing process will increase the safety by more than twice. Dieldrin concentration in air in the moth-proofing process was determined by the bioassay method. Near the boiling dye bath containing dieldrin, it was 0.09 mg/cu. m. on an average (range: 0.06 to 0.14 mg/cu. m.), revealing the concentration far less than 0.25 mg/cu. m. in the threshold limits by ACGIH. When the lid was kept half opened simulating the most careless conditions, the concentration rose to 0.62 mg/cu. m. This was, however, an unreasonable figure in routine conditions. (Author's summary, modified).##

07368

Harashima, S. H. Nakarai, and R. Nakamura

DIFFERENCE IN RESPONSES OF TWO STRAINS OF MICE TO BENZENE INHALATION. Text in Japanese. Japan J. Ind. Health (Tokyo), 7(11):8-12, Dec. 1965. 11 refs.

Strain differences of responses to acute and long-term benzene inhalations was investigated in male mice of CFW and ddN lines. Observed responses included mortality and lethal time by acute exposure to higher concentrations of benzene, and changes in leucocyte counts and hemoglobin levels after repeated inhalations of lower concentrations. Groups of mice aged 5, 7 and 10 weeks for both strains were exposed to 1.5% benzene and mortalities were observed. Mice of both strains were exposed, at 10 weeks of age, to 1% and 2% benzene and lethal time was determined for each animal. After 20-days exposure to 200 ppm benzene, leucopenia was found only in ddN, and a decrease of hemoglobin concentration, on the contrary, was observed in CFW and not in ddN. From the results, it was concluded that the susceptibility of adult mice to the inhaled benzene of higher concentrations was greater in ddN than in CFW, and its variance was smaller in ddN than in CFW. Consequently, it was noted that ddN was more suited for studying acute response, such as mortality or lethal time, to benzene inhalation in mice.##

07475

Gusev, I. S.

A COMPARISON OF THE EFFECTS OF LOW CONCENTRATIONS OF BENZENE, TOLUENE AND XYLENE. (Sravnitel'naya otsenka deistviya malykh kontsentratsii benzola, toluola i ksilola.) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(2): 159-161, Feb. 1967. 7 refs.
CFSTI: TT67-51409/1

Investigation of the effects of exposing animals to low concentrations of benzene, toluene and xylene over a prolonged period of time (85 days) is described. The 105 male albino rats used were divided into seven groups: 15 animals in each group. Purified air was supplied to the chamber containing the first group of animals (controls) at a rate of 30 - 35 l/min. The other chambers were supplied, at the same rate, with air containing admixtures of the vapors with the substances in question. The concentrations of benzene, toluene and xylene in the chambers were checked daily. Concentrations of 15 mg/cu. m. caused marked changes in cholinesterase activity and in the white blood count of animals continuously exposed to these substances over a prolonged period of time. The magnitude of the changes increased from benzene to xylene, while the rate of recovery diminished in the same direction. Toluene in a concentration of 0.6 mg/cu. m. and xylene in a concentration of 0.3 mg/cu.m. produced no effect on the experimental animals throughout the period of exposure, so that these may be recommended as the mean daily maximum permissible atmospheric concentrations. As little is yet known regarding the absence of cumulative properties when low concentrations of benzene are involved, the mean daily maximum permissible concentration should remain at the present level of 0.8 mg/cu. m., which is only half the noneffective concentration of this substance established by the above experiments.

01573

Yasch, H. E.

COMBINED EFFECT OF ACETONE AND ACETOPHENONE IN THE ATMOSPHERE. (Kombinirovannoe deistvie atsetona i atsetofenona v atmosfernom

vozukhe.) Text in Russian. Gigiena i Sanit., 30(8), Aug. 1965. 7 refs. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(8):179-.85, Aug. 1965.
CFSTI: TT66-51033/1

When acetone and acetophenone act together, their odors are completely summated. The combined effect of acetone and acetophenone on ocular sensitivity to light and electrical activity of the brain displays complete summation. When acetone and acetophenone are simultaneously present in the atmosphere, their maximum one-time concentration, expressed in fractions of the accepted separate maximum permissible concentrations, should not exceed 1.5. Prolonged poisoning of albino rats with acetone and acetophenone concentrations of 1.855 and 0.0165 mg/cu m. (the sum total of the fractions of their separate maximum permissible concentrations being 10.9) for 84 days caused disturbances of the normal chronaxial ratio of antagonistic muscles, inhibited the activity of cholinesterase, increased the excretion of coproporphyrins and 17-ketosteroids in the urine, and produced eosinopenia. No effect was produced by an acetone plus acetophenone mixture having a total concentration of 1.2. In the case of the combined presence of acetone and acetophenone in the atmosphere, their mean daily concentration expressed in fractions of their separate maximum permissible concentrations should not exceed 1.2.##

07574

Statnek, M. K.

MAXIMUM PERMISSIBLE CONCENTRATION OF DICYCLOHEXYLAMINE NITRITE IN THE AIR OF FACTORIES. (Materialy k gigienicheskomu normirovaniyu nitrita-ditsiklogeksilamina v vozdukhe proizvodstvennykh pomeshchenii.) Text in Russian. Gigiena i Sanit., 30(8), Aug. 1965. 3 refs. Engl. transl. by Israel Program for Scientific Translations, Hyg. Sanit., 30(8):208-212, Aug. 1965.
CFSTI: TT66-51033/1

Dicyclohexylamine nitrite (DAN) is an inhibitor of the atmospheric corrosion of ferrous metals and belongs to a class of aminocyclic compounds. On intragastric introduction, LD50 of this compound for mice amounts to 80 mg/kg and for rats 125 mg/kg, no local irritating effect was noted. Repeated inhalation of DAN in the form of vapors at a concentration of 0.009, 0.004 and 0.002 mg/l produces no signs of intoxication. The maximum permissible concentration of DAN in the air of the working zone is recommended to be at a level of 0.001 mg/l. (Author's summary

07762

Hsu, Wen-Tah, John W. Hooks, Albert V. S. Tsai, and Samuel S. Nelson

THE INFLUENCE OF POLYCYCLIC AROMATIC HYDROCARBONS ON BACTERIOPHAGE DEVELOPMENT, II. Proc. Natl. Acad. Sci. U. S., Vol. 55, p.1475-1482, June 1966. 11 refs.

Further information is provided on the nature of the hydrocarbon response in infected and noninfected Escherichia coli spheroplasts. A method is described for preparing infected spheroplasts from cells preinfected with phage which permits one to assay the hydrocarbon effect on the replication of both single- and double-stranded viruses whereby significant differences are observed. The present study demonstrates the inhibition of viral nucleic acid and protein synthesis by 7,12-DMBA, and, in contrast to one of the authors earlier observations, it is now reported that 7,12-DMBA inhibits nucleic acid and protein synthesis in the bacterial host itself. The protective effect of various aromatics on 7,12-dimethyl-benzanthracene induced viral inhibition is also reported.

07781

Harington, J. S. and Marianne Smith

STUDIES OF HYDROCARBONS ON MINERAL DUSTS: THE ELUTION OF 3:4 BENZPYRENE AND OILS FROM ASBESTOS AND COAL DUSTS BY SERUM. Arch. Environ. Health, 8(3):453-456, March 1964. 12 refs.

The effectiveness of serum to remove 3-4 benzopyrene and oil from asbestos and coal was investigated. The material examined consisted of virgin crocidolite, amosite, and chrysotile from South African asbestos fields. The following experiments were performed: 1. The Adsorption of 3:4 Benzpyrene on Washed Asbestos and Coal Dust. 2. The Elution of Freshly Adsorbed 3:4-Benzpyrene from Washed Crocidolite, Chrysotile, and Coal Dust by Serum. 3. The Elution of 3:4-Benzpyrene From Natural Crocidolite and Coal Dust by Serum. Chrysotile asbestos adsorbed 100% 3:4-benzpyrene from solution after 48 hours at 37 C compared with 40% and 47% for crocidolite and coal, respectively, and 10% for amosite. No correlation was found between the degree of adsorption of 3:4-benzpyrene and the extent to which it was eluted by serum. Serum eluted the naturally occurring oils more effectively from coal dust than it did from crocidolite fiber and was slightly more effective than cyclohexane in eluting 3:4-benzpyrene from coal and crocidolite. 3:4 Benzpyrene was eluted more easily from (natural) coal and crocidolite than it was after it had been freshly adsorbed on dusts previously freed of their naturally associated hydrocarbons. These findings are discussed in relation to the pathogenesis of coal workers' pneumoconiosis and asbestos malignancy.

07785

Toth, B. and F. Shubik

CARCINOGENESIS IN ARH MICE INJECTED AT BIRTH WITH BENZO(A)PYRENE AND DIMETHYLNITROSAMINE. Cancer Res., 28(1):43-51, Jan. 1967. 26 refs.

Newborn ARH mice were injected s.c. with either 200 micrograms of benzo(BP) or with 30 micrograms of dimethylnitrosamine (DMN). The BP was found to result in a more rapid occurrence of malignant lymphomas than observed in the controls and to result in many lung adenomas. The DMN had no apparent effect on the development of virally mediated lymphomas but resulted in the appearance of benign and malignant liver tumors and lung adenomas.##

07842

Lewis, T. R., F. G. Hueter, and R. A. Busch

IRRADIATED AUTOMOBILE EXHAUST. (ITS EFFECTS ON THE REPRODUCTION OF MICE.) Arch. Environ. Health, 15(1):26-35, July 1967. 30 refs.

This study attempts to define the relative importance of pre-exposure of each member of the sexual pair to irradiated auto exhaust, and exposure of the female partner and her litter, following removal of the male with regard to conception, fetal development, fecundity, and infant survival. There were 150 virgin female mice preconditioned to either filtered air or irradiated automobile exhaust for 46 days, who were randomly paired with 150 similarly preconditioned males. All mice were 12 to 13 weeks of age at the time of mating and were caged individually during the preconditioning period. Males and females were paired randomly to form approximately equal numbers of sexual pairs (10 or 19) in each of eight treatment groups. The experiment was repeated with a new population of mice of the same strain 15 days after completion of the first investigation. The adverse effects of pre-conditioning male mice with irradiated auto exhaust on conception, implantation of fertilized ova, fecundity, and infant survival appear to be induced by a common mechanism. This is the first experiment the results of which imply mutational effects on mammalian cells by components or subsequent products of irradiated auto exhaust. An effect of the alteration of one environmental factor in this investigation, i.e. atmosphere to which the females were exposed, was evidenced by mild stress on litter sizes. Litters born in an atmosphere of irradiated auto exhaust showed a marked increase in mortality in both experiments, but the magnitude differed.##

07886

Armstrongelo, J. J., B. P. Giordan, and B. P. Johnson

SURFACE BEHAVIOR OF INDIVIDUAL LIPIDS SIMILAR TO CONSTITUENTS OF PULMONARY SURFACTANT. Edgewood Arsenal, Md., Medical Research Lab., Project 1C622401A097, Task 1C622401A09708, EATR 4087, 22p., April 1967. 22 refs.
CFSTI, DDC: AD 651001

Surface films of amphipathic neutral lipids and phospholipids, similar to those found in pulmonary surfactant, were characterized by their surface behavior, including that under high surface pressure. Each lipid was studied with respect to equilibrium point, hysteresis, hypercompressibility, and isotension point, the last two being newly defined parameters. It was found that saturated (straight) hydrocarbon chain molecules exhibited much lower isotension-point surface tensions than did their respective unsaturated (branched) analogs, whereas the reverse was true for the equilibrium-point surface tensions. Saturated compounds exhibited considerably more hypercompressibility than did their unsaturated analogs. The ordering of limiting surface tension at highest compression (the isotension point) was not exclusively dependent on obvious steric factors; rather, subtle and undefined electronic factors were also participating. The significantly lowest surface tensions obtained on compression were exhibited by

dipalmitoyl lecithin, sphingomyelin, and palmitic acid. The last compound demonstrates that lipids other than phospholipids can exhibit surface activity similar to pulmonary surfactant. Development of post-isotension-point hysteresis was limited to the saturated class of molecules tests. AA

07952

6. Tope

HEALTH IMPAIRMENT FROM EXHAUST GASES WITH SPECIAL REFERENCE TO SPECIAL VEHICLES AND POWER EQUIPMENT. (Gesundheitsschadigungen durch Auspuffgase unter besonderer Berucksichtigung von Spezialfahrzeugen und motorisiertem Gerat.) Text in German. Stadthygiene (Geizen/Hasburg), 16(2):29-37, Feb. 1965. (37) refs.

Data on concentrations and effects of lead, carbon monoxide and carcinogenic compounds like benzpyrene were assembled. The maximum allowable concentration of 4 mg lead/cu m is exceed on many urban arterial streets e.g. in center city Philadelphia, Pa., 9.5 mg/cu m were found. Milk from cattle grazing on pastures near highways may be endangered since up to 3000 mg lead/kg grass have been found. But the most dangerous component of exhaust gases is CO which causes impaired vision, fatigue and may lead to heart and brain damage. It thus may become directly responsible for traffic accidents. The maximum allowable concentration value is 0.01% by volume which may be exceeded in heavy traffic in particular if the driver of an automobile smokes. Organic compounds may lead to lung cancer. Here especially benzpyrene which can be found both in exhaust gases and on road surfaces originating from tar and rubber tires may be incriminated. Control measures such as scrubbers and afterburners on exhausts are described. Their maintenance is tricky and expensive which so far has prevented compulsory use. Particularly hazardous are street cleaning equipment and trash removal trucks since workers must almost constantly be near the exhaust. Similar problems are posed by lawn mowers, chain saws, cranes, tractors, pesticide sprayers and similar equipment. Small engines are very difficult to modify to limit air pollution. The problem of air pollution from engine exhaust gases can only be tackled by legislation and technical improvements and innovations.##

07956

Schuttmann, W.

POLYNEURITIS AFTER OCCUPATIONAL CONTACT WITH DDT. ((Polyneuritis nach beruflichem Kontakt mit DDT.)) Text in German. Z. ges Hyg. (Berlin), 12(5):307-315, May 1966. 16 refs.

For more than 11 yrs a woman was exposed to DDT. She frequently worked 8 hrs/day disinfecting indoor areas, wearing neither masks nor gloves, and had inhaled or swallowed air containing DDT. The symptoms - a severe polyneuritis, with previous and/or concomitant tiredness, anorexia, circulatory disorders, interrupted pregnancy - all support the view that the etiological factor was contact with DDT. The literature on the

untoward effects of DDT-inhalation is reviewed and the data from 15 cases are compared with the present instance.##

07964

Upholt, W. M. and P. C. Kearney

PESTICIDES. New Engl. J. Med., 275(25):1419-1426, Dec. 22, 1966. 28 refs.

The modern trend in the introduction of new pesticides has been toward those with more specific biologic activities. This results in less disturbance of the environment, but multiplies the number of chemicals that must be considered. Pesticides may contribute to pollution of the air to some extent, but their major effect is in the contamination of vegetation and water. Due to the activity of soil microorganisms, most pesticide residues are not showing a progressive accumulation in the soil. For humans, pesticides do appear to present a hazard at distances greater than the spray can be seen to drift. However, herbicides may damage crops several miles from the point of application. Understanding the health hazards of specific pesticides is simpler if they are grouped according to chemical structure. Among the organic phosphorus compounds, tetraethylpyrophosphate (TEPP) has a direct inhibitory effect on acetyl and non-specific cholinesterases and it is rapidly absorbed making handling quite hazardous. The mode of action of chlorinated hydrocarbons has never been clearly established, although for DDT it has recently been proposed that it might be the formation of a charge transfer complex in the axon. The carbamate group includes the methyl carbamates, which are weak cholinesterase inhibitors, and the phenyl carbamates which have a very low order of toxicity. Approximately half the annual deaths due to pesticides occur through ingestion. It seems, therefore, that the greatest human hazard stems from careless handling.##

07972

Hays, Richard B.

APPLICATION OF CELL CULTURE AS A PRIMARY TOXICITY SCREEN OF POSSIBLE SPACECRAFT CONTAMINANTS. National Aeronautics and Space Administration, Langley Station, Hampton, Va., Langley Research Center, NASA-TN-D-4251, 12p., Nov. 1967. 11 refs.

Cell culture has been investigated with regard to its applicability as a primary toxicity screen. Forty-nine compounds have been screened by this method. These compounds are all contaminants which may occur in manned spacecraft. The data presented indicate that cell culture can be a useful tool for selecting, from a long list, those compounds most likely to be toxic to a living system. The compounds tested might be ranked, in terms of decreasing toxicity to cells in culture, as follows: unsaturated aldehydes, amines, aldehydes, acids, ketones, and alcohols. (Author's Summary)##

08015

M. H. Siegers

PETROLEUM ASPHALT INHALATION BY MICE. EFFECTS OF AEROSOLS AND SMOKE ON THE TRACHEOBRONCHIAL TREE AND LUNGS. Arch. Environ. Health, Vol. 9, p. 728-734, Dec. 1964. 16 refs.

The effects on the tracheobronchial tree and lungs of 30 C57 black mice inhaling an aerosol of petroleum asphalt and another group of 30 mice inhaling smoke from heated petroleum asphalt were studied. The most frequent changes were peribronchial infiltration of round cells, bronchial dilation, and destruction and atrophy of the epithelium. Thickening of the alveolar septa and emphysema were seen occasionally. Squamous metaplasia was frequent but hyperplasia occurred. The changes were characterized by variability with respect to length of exposure and location of the lesion in each animal. If any generalization can be made regarding the changes in the lungs of the mice, it is the reduction in the amount of functional respiratory tissue. This is accomplished by a variety of pathological changes. The findings sufficiently parallel those reported by others for the inhalation of cigarette smoke, artificial smog, and other air pollutants, so as to suggest the possibility that the changes in the tracheobronchial tree and lungs are only loosely related to the composition of the inhaled material. The concordance of findings by all investigators on the effects of air pollutants containing aromatic polycyclic hydrocarbons supports the suspicion that the changes are a general phenomenon caused by the non-specific irritating effect of the intire class of chemicals when inhaled over a long time.##

08026

MacEwen, James D. and Robert F. Geckler

COMPARATIVE TOXICITY STUDIES ON ANIMALS EXPOSED CONTINUOUSLY FOR PERIODS UP TO 90 DAYS TO NO_2, O_3 AND CCl_4 IN AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 238-257, Dec. 1966. 6 refs.
CFSTI, DDC: AD 646512

The data obtained from a 90-day continuous exposure of animals to the industrial threshold limit value (TLV) of NO_2, O_3 and CCl_4 are presented. Animal exposure facilities of the Aerospace Medical Research Laboratories were used for the 90-day continuous experiments. The atmosphere compositions were 100% oxygen at 260 mm Hg pressure and air at either 520 (the O_2 = 104 mm Hg) or 740 mm Hg (the O_2 = 148 mm Hg) pressure. The data are unremarkable except for the deaths at 730 mm Hg pressure in the ozone exposures. Mice appear somewhat more sensitive to ozone than the other species. Guinea pigs also showed mortality upon exposure to ozone, which was the only material to which this species was exposed. Note that most of the deaths occurred during the first half of the 90-day exposure suggesting some degree of adaptation in the survivors. The data

are consistent with the hypothesis that the animals first respond to the atmospheric contaminant and then adapt to the changed environment. The data do not, however, reveal significant differences between those animals exposed to contaminants at reduced pressure in 100% oxygen and those exposed at normal atmospheric pressure (760 mm Hg). With respect to the clinical data, although the values of serum enzymes of exposed animals were different from the control values, no adverse effects on the experimental animals were noted. It appears clear that the TLV for space applications may not be radically different from industrial TLV if only the factors of continuous damage, reduced pressure, and pure oxygen atmosphere are considered.##

08028

B.F. Harper, Jr. F.B. Robinson

COMPARATIVE PATHOLOGY OF ANIMALS EXPOSED TO CARBON TETRACHLORIDE AT AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 265-285, Dec. 1966. 18 refs.
CFSTI, DDC: AD 646512

The provocative aspect of these findings is not so much their correlation with the observed histological events as their similarity to the mechanisms thought to be important in oxygen toxicity. Lipid peroxidation, mitochondrial swelling and reduplication, uncoupling of oxidative phosphorylation and depressed levels of reduced pyridine nucleotides have all been observed with oxygen. It is very likely that the basic biochemical mechanisms of both oxygen and CCl4 toxicity are highly similar. The superimposition of the one stress on the other therefore would be expected to have an additive or synergistic effect, and this is what was found.##

08042

D. V. Bowker, A. C. Chamberlain, J. Bunde, D. C. F. Muir, R. L. Thomson

ELIMINATION OF 5 MICRON PARTICLES FROM THE HUMAN LUNG. Nature(London), 215(5096):30-33, July 1, 1967. 5 refs.

Experiments in which a monodisperse aerosol of particles 5 microns in diameter was tagged with chromium-51 so that measurements could be made by external gamma ray counters over the lungs are described. On each occasion the subjects inhaled only a single breath of the aerosol and the particles could penetrate the airways only as far as they were carried by the volume of the inhaled air, which varied between 140 and 500 ml in the different experiments. The elimination of particles from the respiratory tract has two main phases. The rapid phase corresponds to the removal of particles initially deposited on the ciliary mucous and takes 10-20 hours; the slow phase, which has a half period of from 150-300 days, corresponds to those particles which have reached the nonciliated regions.##

06109

F. H. Norris, J. H. Bishop

THE EFFECT OF CALCIUM CARBONATE DUST ON VENTILATION AND RESPIRATORY GAS EXCHANGE IN NORMAL SUBJECTS AND IN PATIENTS WITH ASTHMA AND CHRONIC BRONCHITIS. Clin. Sci. (Cambridge), Vol. 30, p. 103-115, 1966. 24 refs.

Some effects of inhaling calcium carbonate dust have been studied in twenty-four healthy subjects, eight patients with bronchial asthma, and eleven patients with chronic bronchitis. The distribution of ventilation was measured by the single-breath oxygen test and respiratory gas exchange was studied by sampling expired gas and arterial blood. Alveolar ventilation was distributed more unevenly, after breathing dust, in ten of the normal subjects, all of the patients with asthma, and eight of the patients with chronic bronchitis. The increase persisted for 41-55 minutes. In normal subjects the alveolar-arterial difference in oxygen tension (A-aD O2) increased after breathing dust, and remained elevated for 21-25 minutes. There was no significant change in physiological dead space and only a small transient decrease in anatomical dead space. The patients with asthma showed a change in the single breath test which was similar to the normal subjects but the increase in A-aD O2 was more protracted. It was difficult to compare the ventilatory changes in the patients with chronic bronchitis, since the initial slope of the single-breath test was greater than normal. The time course of the increase in A-aD O2 was similar to that in the patients with asthma. Acetyl choline infused into the atrium caused a small increase in A-aD O2 in the control state. On three occasions the infusion was repeated at a time after dust when the A-aD)o2 had returned to normal but the single-breath test remained abnormal; there was then a greater increase in A-aD O2. These results support the hypothesis that vasoconstriction was released, causing a flow of blood through poorly ventilated lung units.##

06151

Rozinova, M. F.

EXPERIMENTAL DETERMINATION OF THE LIMIT OF ALLOWABLE CONCENTRATION OF DICHLORETHANE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases Translated from Russian by D. S. Levine. National Bureau of Standards, Washington, D. C.; Inst. for Applied Tech., Vol. 3, p. 110-118, May 1960.
CFSTI: TT 60-21675

Data were obtained regarding the intensity and other characteristics of dichlorethane air pollution by industrial production and manufacturing plants; parallel with this some experimental data were secured regarding the effect of low dichlorethane concentrations on man. Chlorethan determinations were made by the microcombustion method in a gas analyzer. The results obtained for each plant investigated show that the average concentration ranged form 3.5 to 19.4 mg/cu m. The effect of low concentrations of dichlorethane on man was studied by the method of threshold of odor perception of dichlorethane by the adaptometer

method and by the methods of plethysmography and spirography. Twelve test subjects sensed the odor of dichloroethane in 23.2 mg/cu m concentrations, 5 in 17.5 mg/cu m concentration and one each in 12.2 and 28.9 mg/cu m concentrations. The results of experiments indicate that a 5 mg/cu m concentration was the threshold concentration of dichloroethane affecting the functional state of the vision analyzer and of the vascular and respiratory reactions which was below the threshold concentration sensed by the olfactory organs in Russia that the limit of maximal single concentration of dichloroethane in atmospheric air should not exceed 5 mg/cu m.

08151

Izmerov, N. F.

HYGIENIC STANDARDIZATION OF THE LIMITS OF ALLOWABLE CONCENTRATION OF VAPORS OF GASOLINE IN ATMOSPHERIC AIR. Int Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by N. S. Levine. National Bureau of Standards, Washington, D.C.; Inst. for Applied Tech., Vol. 3, p. 126-134, May 1960.
CFSTI: TT 60-31475

The physiological effects of low air concentrations of gasoline were studied. On the basis of the experimental results it can be concluded that the inhalation of gasoline vapors in 100 mg/cu m concentration under conditions of chronic exposure elicited in white rats clear cut changes in the higher nervous activity, the intensity of which increased with the duration of the exposures, and which disappeared only two weeks after exposure was discontinued. In the case of man the inhalation of gasoline vapors in concentration of 217 mg/ cu m for a brief period of time elicited reflex changes in the optical analyzer so far as sensitivity to light was concerned. The threshold of gasoline odor perception was considerably below the concentrations which elicited the previously noted changes in the functional state of the cerebral cortex; the odor perception threshold concentration was between 6.5 - 10.0 mg/cu m. It appears safe to conclude that the threshold of olfactory gasoline odor perception is the most sensitive index for the determination of limits of allowable concentrations of gasoline vapors in atmospheric air. It is proposed in Russia that a concentration of 5 mg/cu m calculated as C be adopted as the allowable limit of a single maximal concentration of the three grades of Groznensk gasoline investigated.

08210

Vysanyan, A. Yu

THE CARCINOGENIC EFFECT OF SHALE FUEL SOOT ON WHITE MICE. Vopr. Onkol., 4(6):408-411, 1958. 8 refs. Translated from Russian by N. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 191-195, Jan. 1961
CFSTI: TT 61-11149

The cancerogenic properties of shale fuel soot was investigated. Experiments were performed with 210 white mice. The benzene extract of the shale fuel soot was applied to 100 mice twice every week for approximately 25 weeks, or 50 applications. Eighteen

control mice were treated in a manner described above with 2 drops of a mixture of benzene and vaseline. The basic control group consisted of 100 white mice which received no treatment of any kind. Special-fluorescent analysis showed that 3,4 -benzpyrene was present in soot of shale fuel; benzene extract of such soot, applied to the skin of mice, or injected subcutaneously, produced malignant growths, indicating that it possessed cancerogenic properties. Papillomas appeared 5 months after the application of the benzene soot extract to the skin of the experimental mice. Most of the malignant formations resulting from the application of the soot extract to the skin of the experimental mice were malignant epitheliomas, more often squamous cell carcinomas, occasionally cytoblastomas, which frequently metastasized into the local and lung lymphatic nodes. Benzene extract of the shale fuel soot extract vehicle had no blastomogenic properties. Results of the investigations point to the urgent need of adopting energetic measures for the prevention of air contamination with shale fuel soot.

00221

Grigur'ev, E. S.

EFFECT OF VOLATILE SUBSTANCES AND OF GASES ON THE HIGHER NERVOUS ACTIVITY OF WHITE RATS IN THE COURSE OF INHALATION EXPOSURE. Farmakol. i Toksikol., 18(5):49-52, 1955. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 125-130, Jan. 1961.
CFSTI: TT 61-11169

A tightly closing chamber was built which could be used simultaneously for the development of light, sound and motor nutrition conditioned reflexes in rats, and for their exposure to the inhalation of gas, vapor or dust under investigation. Some data of the effects of gasoline vapor and of carbon monoxide on the central nervous system of rats are presented to illustrate the suitability of the chamber described for the recording of rats' conditioned reflex activity changes on a dynamic basis while they are being exposed to the inhalation of gases, vapors or suspended dust.##

00241

Hueper, W. C.

METHODOLOGIC EXPLORATIONS IN EXPERIMENTAL RESPIRATORY CARCINOGENESIS. Arzneimittel-Forsch, Vol. 14, p. 814-822, July 1964. ((84)) refs.

The study, by bioassay methods, of chemicals introduced during the past 30 years into the human environment or to be introduced in the future into the human economy, for carcinogenic effects on the respiratory organs, is assuming increasing importance for the following reasons. The rapid rise in the frequency of lung cancers among the populations of all industrialized countries since the turn of the century indicates that new and potent man-made respiratory carcinogens have entered the human environment. This epidemiologic phenomenon has been associated with the recognition

of a growing number of occupational carcinogens to which large worker groups become exposed and which in part also pollute the general atmosphere and thus act increasingly on the general population. Additional and epidemiologic and experimental evidence incriminates an appreciable number of other chemicals as respiratory carcinogens, some of which are evidently operating following their introduction into the organism by various non-respiratory routes. The thereby demonstrated polyetiology of lung cancers in man and animals militates strongly against a blind acceptance of the widely propagandized scientifically unsound and sociologically irresponsible allegation that cigarette smoking is the proven predominant cause of lung cancer and that, therefore, the control of pulmonary cancer hazards can largely be achieved by simply reducing the consumption of cigarettes and by technological decarcinogenization of cigarette smoke. Despite the various shortcomings in the presently available bioassay methods for testing chemicals for possible carcinogenic effects on the respiratory organs, their wide application nevertheless provides effective safeguards against a further dissemination of these agents. ASSS

05241

Rotin, Paul, and Hans L. Falk

POLLUTED URBAN AIR AND RELATED ENVIRONMENTAL FACTORS IN THE PATHOGENESIS OF PULMONARY CANCER. Diseases Chest., 45(3):236-246, March 1964. 21 refs. (Presented at the 29th Annual Meeting, American College of Chest Physicians, Atlantic City, June 13-17, 1963.)

Data from several spheres of laboratory investigation lend support to the belief that the epidemiologic association between urban residence and lung cancer is of pathogenetic significance. Admittedly, the identification of carcinogenic agents in pollutant sources and in the atmosphere does not inevitably connote an adverse biologic effect. Nevertheless, the findings of the present investigation unite to form a constellation that strongly implicates the atmosphere as one dominant factor in the pathogenesis of lung cancer. The data are accorded additional significance by virtue of their congruity with the epidemiologic pattern of lung cancer. Epidemiologically, a reduction in lung cancer incidence may be properly anticipated as a result of reducing or eliminating the concentration of any of the environmental factors discussed. However, predictions as to the extent of reduction when but one of the factors is eliminated are meaningless in light of the multiplicity of factors described. It is wholly unwarranted to anticipate a quantitative reduction in lung cancer rates equal in number to the percentage showing a statistical association with any environmental source or specific carcinogenic agent. While atmospheric pollution is advanced as but one potential source of agents carcinogenic to the lung, proper evaluation of its contribution to the pathogenesis of lung cancer will be possible only in terms of its relation to the action of other significant environmental sources. ASSS

08244

Litvinov, E. F.; Goldberg, E. S.; and Rimina, S. N.

MORBIDITY AND MORTALITY IN MAN CAUSED BY PULMONARY CANCER AND ITS RELATION TO THE POLLUTION OF THE ATMOSPHERE IN THE AREAS OF ALUMINUM PLANTS. Acta, Unio Intern. Contra Cancer, Vol. 19, p. 742-745, 1963.

The discharge of carcinogens by aluminum plants was studied by sedimentation and aspiration methods. It was found that over 10 kg of 3,4-benzpyrene was discharged per day into the atmosphere. The distribution in snow and dust in the environment was analyzed. Chronic morbidity of the respiratory tract was studied as a disease predisposing to cancer in three test groups and a positive correlation with air pollution was established, as was done for actual cancer incidence. (Authors' summary)

08276

Schlipkoter, H. W.; A. Brockhaus, and E. Weimer

EXPOSURE OF LARGE CITY INHABITANTS TO SOLID AND LIQUID AEROSOLS. [Die Belastung des Grossstadtmenschen durch feste und flussige Fremdaerosole.] Text in German. Zentr. Bakteriol., Parasitenk., Abt. I, Orig. (Jena), Vol. 198, p. 113-131, Dec. 1965. 5 refs.

Hamsters were forced to inhale a dust of a constant Degussa soot concentration of 20-50 mg./cu m daily for 8 hours, simulating the dust in large cities which contains about 30% carbon and soot caused by incomplete combustion. The animals were killed at intervals varying from 1 1/2 to 67 hours. The lung tissue was fixed and examined with an electron microscope. Nine illustrations are provided showing the cytological conditions of the tissue at various time intervals. After one to two hours exposure, the soot particles were found exclusively in the extracellular tissues of the alveoli. After 8 hours a phagocytosis of the soot dust was observed. The soot particles which lay in the vacuoles were extremely hard; with increasing exposure the vacuoles increased in size and eventually overlapped, causing the cytoplasma to dissolve. After 32 hours the tissue consisted mainly of cell fragments containing soot particles and after 67 hours fused particles were found whose primary parts could not be differentiated. These experiments show that even relatively insoluble compounds can cause harmful alterations in lung tissue. Since benzopyrene is readily absorbed by soot and can be found in the atmospheric dust of large cities, 12 gamma benzopyrene absorbed on 20 mg. soot was injected into white rats and the animals killed at different time intervals. Eighty per cent of the benzopyrene was dissolved from the soot and 20% stayed absorbed over a period of 30 days. The damage caused to the lung tissue, and the relatively quick dissolution of benzopyrene in vivo, makes the elimination of soot as a pollutant a matter of primary importance.##

00295

Barnes, R. and R. C. Jones

CARBON TETRACHLORIDE POISONING. Am. Ind. Hyg. Assoc. J., p. 557-560, Nov.-Dec. 1967, 6 refs.

Three cases of poisoning by carbon tetrachloride in one industry are reported. Liver damage as evidenced by altered liver function tests was a feature of other workmen of this plant also exposed to carbon tetrachloride. Kidney damage, which is a feature of other reported cases of carbon tetrachloride poisoning, was only shown by one of the cases reported here. The dangers of carbon tetrachloride are noted, and care in its industrial and household use is emphasized. (Authors) summary)

00305

Nagawa, Jun

THE USEFULNESS OF THE METHOD OF SINE WAVE OSCILLATING PRESSURE FOR MEASURING TOTAL RESPIRATORY FLOW RESISTANCE IN HUMAN SUBJECTS AND GUINEA PIGS. Text in Japanese. Japan. J. Hyg. (Tokyo), 21(6):625-636, Feb. 1967. 18 refs.

The validity and applicability of a sine wave oscillation method for measuring total respiratory flow resistance in man and guinea pigs were investigated. Diagrams giving exact measurements of the body plethysmographs and the pressure imposing device used in the experiments are provided. The frequency of the sine wave oscillation with which the activity of the chest-lung system becomes zero, was found to be ? approximately 9 c.p.s. in both man and guinea pig. Over 12 c.p.s. the impedance of the system showed a steep rise. By analysing the flow and its imposed pressure curves, it was found that the total respiratory flow resistance showed continuous change according to the different stages of the flow curve. By the use of an artificial mouthpiece resistor having three kinds of known resistance in man, the frequencies ? approximately 9 c.p.s. also showed the most pertinent reproducibility, and the impedance was overestimated by frequencies below or above this range. When this technique was applied to the short term inhalation study of low concentration of SO2 (1.5-2.0 ppm) in man, it revealed rapid response and individual difference of the sensitivity of the total respiratory flow resistance after a few seconds of the exposure. In long term exposure of guinea pigs to 0.1 ppm of toluene diisocyanate vapor without any surgical treatment, the animals showed a repeated day to day response with different individual sensitivity, and when sodium chloride aerosols were added the response of the total respiratory flow resistance was affected in a meaningful pattern. The results, which are illustrated in graphs and tables, show this procedure to be a relevant and sensitive method to evaluate the behavior of the respiratory air way in both man and guinea pig in short or long term studies of environmental toxic materials.

00329

Love, Edward B., Jr., August Curley, and Frank J. Biros

MEN WITH INTENSIVE OCCUPATIONAL EXPOSURE TO DDT. A CLINICAL AND CHEMICAL STUDY. Arch. Environ. Health, Vol. 15, p. 766-775, Dec. 1967. 25 refs.

A study was made of 35 men with 11 to 19 years of occupational exposure to DDT. Findings from medical history, physical examination, routine clinical laboratory tests, and chest x-ray film did not reveal any ill effects attributable to exposure to DDT. The overall range of storage of the sum of isomer and metabolites of DDT in the men's fat was 18 to 657 ppm as compared to an average of 8 ppm for the general population. Based on their storage of DDT in fat and excretion of DDA in urine it was estimated that the average daily intake of DDT by the 20 men with high occupational exposure was 17.5 to 18 mg per man per day as compared to an average of 0.04 mg per man per day for the general population. There was significant correlation (r = +0.88) between the concentration of total DDT-related material in the fat and serum of the workers. The concentration in fat averaged 338 times greater than that in serum. Workers store a smaller proportion of DDT-related material in the form of DDE, and the difference is related chiefly to intensity rather than duration of exposure. DDE is relatively much less important and DDA much more important as excretory products in occupationally exposed men than in men of the general population. (Authors' summary, modified)##

00139

Tsuingao, Hano

SOOT HAZARDS INVESTIGATED FROM THEIR CARCINOGENIC ASPECTS. Staub (English translation), 27(8):18-19, Aug. 1967. 3 refs.
CFSTI: TT 67-51408/8 (-MC $2.00)

Experiments carried out on rats shows that subcutaneous implantation of benzopyrene combined with soot can cause sarcomata. The result is affected by the high number of soot eruptions. Sarcoma yield depends on complete remainder of the implantate. The investigation of the residual implantate in the case of rats has shown that, if the action in an animal body is sufficiently long, benzopyrene is completely eliminated from the implantate.

00419

Lawther, P. J.

AIR POLLUTION, BRONCHITIS AND LUNG CANCER. Postgrad. Med. J. (London), Vol. 42, p. 703-708, Nov. 1966. 13 refs.

The emission of pollutants at levels close to the ground and during adverse meteorological conditions, such as temperature inversion, contribute to low altitude air pollution. Particulate matter in the air can be measured by optical and electron microscopy. An electron micrograph of common solid pollutants and a table showing the average and maximum winter concentrations of common gaseous pollutants in central London during 1956-1964 are provided. The results of various field and laboratory tests indicate that irritants in smoke, rather than SO2, were the

causative agents for the exacerbation of existing chest diseases. While simple bronchitis may be caused by cigarette smoking, chronic bronchitis is related to urban factors. Tests further support the theory that the rise in the incidence of lung cancer is correlated with the incidence of cigarette smoking rather than with the level of polycyclic hydrocarbons in coal tar, coal smoke, and soot. Urban factors are also involved in the genesis of lung cancer. As a remedial measure it appears reasonable to recommend that fuel be burned centrally, and that the effluents be dispersed from tall stacks.##

00431

V. B. Tsulaya

THE SANITARY AND TOXICOLOGICAL CHARACTERISTICS OF THE EFFECT OF A MIXTURE OF BENZENE AND ACETOPHENONE VAPORS IN THE ATMOSPHERE.
((Sanitarno-toksikologicheskaya kharakteristika sovmestnogo deistviya smesi parov benzola i atsetofenona v atmosfernom vozdukhe.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(9-3):10-10, April-June 1967. 1 refs.
CFSTI: TT 67-51409/3

As a result of studying the reflex action of a mixture of benzene and acetophenon vapors on the human body, it is concluded that the effect produced by this mixture is the summation of effects of the two substances. An investigation of the resorptive action of a mixtures of benzene and acetophenon vapors in a concentration of 9.7 and 0.030 mg/cu m consecutively revealed a series of shifts in the central nervous and hemopoietic systems and the nucleic acids content in the blood of experimental animals. A mixture of benzene and acetophenon vapors in a concentration of 0.91 and 0.0030 mg/cu m, consecutively, had no noxious effect on experimental animals. (Author's summary)##

00432

I. I. Kulinskaya

EFFECT OF CHRONIC EXPOSURE TO LOW CONCENTRATIONS OF TOLUENE ON THE ACETYLCHOLINE SYSTEM IN THE BLOOD OF RABBITS.
((Vliyanie khronicheskogo deistviya malykh kontsentratsii toluola na sistemy atsetilkholina v krovi krolikov.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(5-6):291-295, April-June 1967. 9 refs.
CFSTI: TT 67-51409/3

Alterations in the acetylcholine system were studied with a view to identifying early signs of poisoning with small doses of toluene. This system is a sensitive indicator of the functional state of the nervous system. Shifts occurring in this system on long-term exposure to benzene had been determined earlier. Chronic effects of low concentrations of industrial substances are accompanied by changes in the overall reactivity of the organism. Therefore this experiment combined the poisoning of experimental animals together with inoculation with typhoid vaccine. Changes in acetylcholine

concentration in blood appeared already at early stages of the unfavorable effect on the organism, before the appearance of changes in the activity of the AC-decomposing enzyme. Therefore, it is not expedient to limit studies of chronic poisonings to investigations of acetylcholinesterase activity, but parallel determinations of AC concentration should also be performed. Accumulation of AC in blood and increase in the AChE activity in the first and in the second periods of chronic poisoning point to an increased functional activity of the nervous system while the decrease in the mediator exchange indices in the third period points to possible inadequacy (humoral decompensation phase). The results confirmed that the process of prolonged poisoning initially intensified the functions of different systems but later these functions become weakened according to the depletion of the compensatory resources of the body.##

09441

Sh. D. Khikmatullaeva

MAXIMUM PERMISSIBLE CONCENTRATION OF THIOPHENE IN THE ATMOSPHERE. (Materialy k obosnovaniyu predel'no dopustimoi kontsentratsii tiofena v atmosfernom vozdukhe.) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(4-6):319-322, April-June 1967. 8 refs.
CFSTI: TT 67-51409/2

The single maximum permissible concentration of thiophene in the atmosphere was set at a level of 0.6 mg/cu m by means of determining its threshold values of smell (2.1 mg/cu m), of ocular-light sensitivity and that of the bioelectric activity of the human cerebral cortex (0.8 mg/cu m). A study of the resorptive action of thiopene at concentrations of 20 and 3 mg/cu m on albino rats revealed definite shifts in the chronaxy muscle-antagonists, in the content of protein fractions, of sulfhydride groups, and that of sialic acids in the blood serum, in the leucocyte count and formula of the blood, in the level of coproporphyrins in the urine and that of ascorbic and pyro tartaric acids in the organ tissues. As thiophene at a concentration of 0.6 mg/cu m proved to be ineffective, it is suggested that this concentration be set as the daily average maximum permissible concentration of the substance in the atmosphere. (Author's summary)##

09493

Nagatani, Hirouhi

THE RESPIRATORY DEPOSITION OF POLYSTYRENE AEROSOLS IN MAN. Text in Japanese. Japan. J. Hyg. (Tokyo), 21(6):417-423, Feb. 1967. 15 refs.

Aerosols were generated from three sizes of polystyrene particles (0.188, 0.557, and 1.305 micron diameters) suspended in water. The aerosols were stocked in a 9-liter, Benedict-Roth type spirometer to dry and then were inhaled. Subjects (7 healthy males and 1 female, 22-29 years old) were asked to breathe the aerosols through the nose, while sitting, at rates of 10, 15, or

20 inspirations per minute. Each experiment lasted 1-2 minutes; 60 were performed in all. Results are tabulated. Aerosol concentration was measured by the Rimoto light-scatter photometer (Sinclair-Phoenix type); 10 consecutive respirations were recorded to get an average deposition rate for one experiment. Average concentrations of the aerosols were estimated for inspired and expired air, and deposition rates computed for one respiratory cycle. The effects of respiratory rate, tidal volume, and respiratory flow rate on deposition are discussed. Aerosol deposition in the respiratory tract varies from subject to subject, and according to particle size, so that the larger the particles, the higher the percentage deposition. Aerosols with diameters of 0.188 or 0.557 microns exhibit similarly low deposition rates, suggesting that the minimum deposition size approaches these two sizes. The lower the respiratory rate, the greater the deposition (particularly for 1.305 micron particles). Tidal volume and flow rate have no relation to deposition rate.##

00511

Anderson, Donald O.

THE EFFECTS OF AIR CONTAMINATION ON HEALTH: A REVIEW. PART II.
Can. Med. Assoc. J. (Toronto), Vol. 97, p. 585-591, Sept. 9, 1967. 103 refs.

The literature on the health effects of specific pollutants is reviewed. Included are studies on dustfall, sulfur dioxide, oxidizing pollution (as a mixture, or when broken into three components: carbon monoxide, oxides of nitrogen, ozone, and peroxyacetyl nitrate), polycyclic hydrocarbons, industrial sources of community air pollution (especially arsenic, beryllium, and asbestos), and several other pollutants. The effects of low levels of common air pollutants, classified as particulate matter, irritants, oxidants, and systemic poisons, are not known precisely. According to one study, high and significant correlations were obtained between lung cancer mortality in men, and levels of beryllium, arsenic, zinc, molybdenum, vanadium, cobalt, manganese, lead, and titanium. No correlation was observed for nickel and antimony. In terms of magnitude of the effect, the hazard of long-term exposure to levels of urban pollution is much less than that of personal air pollution by cigarette smoking. The biological effect, however, is similar to that of smoking, and is documented in excess mortality, respiratory conditions, and possibly also in respiratory cancer. The most important constituent currently measured in the air is dust.

00526

Borina, L. A.; T. N. Sukharevskaya, and E. A. Solovova

VOPR MEKHANIZM RAZVITIYA GEMORRAGICHESKOGO SINDROMA PRI KHRONICHESKOY INTOKSIKATSII BENZOLOM.
Text in Russian.
Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(8):36-41, Aug. 1966. 19 refs.

A study of the blood coagulation system in chronic benzene intoxications showed that hemorrhage is caused mainly by the quantitative and qualitative deficiencies of the platelets (thrombocytopenia and thrombocytopathy) which lower the activity of the blood coagulation system, increase fibrinolysis and change the properties of the vascular walls (disturbed endothelial barrier and increased permeability). Hemorrhagic symptoms are experienced not only in patients with thrombocytopenia but also in patients with normal platelet counts suffering from thrombocytopathy.

08598

Davis, Kieffer

ENVIRONMENTAL HEALTH RESEARCH: INTERACTION OF SULFUR AND OTHER ATMOSPHERIC CONTAMINANTS, PROGRESS REPORT. Mod. Bull. Standard Oil New Jersey, 27(3):258-269E Nov. 1967. (Presented at the 32 Midyear Meeting, American Petroleum Institute's Division of Refining, Los Angeles, Calif., 1967.)

The objectives and general experimental designs are presented of research projects which are currently sponsored by the American Petroleum Institute: 1) research into biological tolerance to air pollutants and mechanisms of SO2 toxicity; 2) research into the chronic effects of pollutants in sand and the relationship between onset of acute morbidity and death; 3) study of experimental emphysema in laboratory animals and possible effects of SO2, oxides of N, and particulates; 4) investigation of the conditions and concentrations of aromatic hydrocarbons that may produce lung cancer; and 5) study of the combined effects of environmental contaminants. Available results indicate that monthly morbidity is quite high in a selected group of out-patients and may give sufficient data to correlate with air quality. In the animal studies, no pattern is found indicating any effect which may be relatable to inhalation of the dusts used, with or without adsorbed gas. Benzo(a)pyrene particles instilled intratracheally in hamsters induce a high incidence of carcinomas.

08601

Hagges, Dieter

EFFECTS OF THE MOTOR VEHICLE EXHAUST GASES ON HUMANS, ANIMALS AND PLANTS. [Auswirkungen der Motorfahrzeugabgase auf Menschen, Tiere und Pflanzen.] Text in German. Z. Präventivmed., Vol. 11, p. 151-170, March-April, 1966. 20 refs.

The various toxic components in automobile exhaust gases are reviewed. To determine the amount of carbon monoxide inhaled by the population, the carbon monoxide hemoglobin content of 331 policemen and 597 automobile drivers was determined during a test for alcohol. The nonsmoking policemen did not exceed the 5% limit, but 25% of smoking policemen and 40% of the drivers did. The amount of lead in the street, in windowsill dust, and in the street air was well as in the blood of office workers, metal workers and garage workers was determined in Zurich between 1960-1963. While the amount of lead in the dust of the street, air, and window sills increased significantly by 1965, the amount found in the

blood increased only slightly. Soot is considered deleterious as a carrier of other water soluble toxic substances into the lungs. The hygienic limit of 0.5 cc/cu m for oxides of nitrogen is only seldom exceeded. Sulfur dioxide emissions are negligible. Hydrocarbons and polycyclic hydrocarbon emissions from motor vehicles contribute only a few percent to the rise in lung cancer. The paraffin and olefin hydrocarbons are nontoxic to humans, animals and plants, while ethylene is highly toxic to plants. While in Europe oxidants do not contribute significantly to air pollution, compounds such as ozone and peroxyacylnitrate contribute to air pollution in tropic and subtropic climates with a high concentration of motor vehicle traffic, particularly under adverse meteorological conditions. The psychological problems caused by air pollution are discussed and it is concluded that the psychological effects cannot be dismissed lightly.##

08897

Feimeister, Alvin, Mohammad Ananat, and M. D. Weiner

INTERACTION OF NITROGEN DIOXIDE--OLEFIN GAS MIXTURES WITH LECITHIN MONOMOLECULAR FILMS. Environ. Sci. Technol., 2(1):60-63, Jan. 1968. 15 refs.

The interaction of nitrogen dioxide-olefin gas atmosphere with saturated lecithin monomolecular films were investigated using surface pressure measurements. Films of dipalmitoyl lecithin, a saturated phospholipids, showed no interaction with any of the test atmospheres used. Films of egg lecithin, an unsaturated phospholipids, showed significant changes in the surface pressure - surface area curves in the presence of all atmosphere containing nitrogen dioxide. The observed effects appear to be the result of a chemical interaction of NO2 with the double bonds of the egg lecithin rather than a simple physical penetration of the film. Biological implications are discussed. (Authors' abstract.)

09002

Smith, W.

THE PULMONARY TOXICOLOGICAL MANIFESTATIONS OF TERPENE PARTICLES. Intern. J. Biometeorol. Biometeorol. Suppl. (Leiden), Vol. 11, 17p., 1967.

In 1965, at the Washoe Medical Center in Reno, Nevada, asthmatic patients had questionnaires completed as to their residence, sites of visitation, and vegetation in their immediate surroundings during the 24-hr. period immediately prior to attack. Attacks were seasonal and occurred primarily when the number of terpene particles in the atmosphere were at their highest levels, as determined with gas chromatography. Data were then exposed to measured quantities of terpene particles liberated into altitude chambers under controlled atmospheric conditions. They were sacrificed, autopsied, and the lungs studied using gross, microscopic, and angiographic techniques in order to correlate pathologic changes with those occurring in the asthmatic man. When normal white rats were

subjected to approximately 20-30 parts of alpha-pinene for the first time, the animals became lethargic within 5 min., severely agitated in 10-15 min., convulsed in 20 min., and died within 30 min. At autopsy, they had lost much tracheal mucous and evinced severe pulmonary and cerebral edema. If removed from the toxic alpha-pinene within 25 min., and placed in either O2 or open air, they recovered; 24 hr. later, the trachea and large bronchi were largely denuded of mucous. Focal areas of inflammation occurred which involved the basement membranes and submucosal glands. If the animals were placed into the chamber for the second or third time, death occurred earlier. (Author's abstract, modified)##

09034

Fried, Josef and Dorothy E. Schuss

ONE ELECTRON TRANSFER OXIDATION OF 7,12-DIMETHYLBENZ(a)ANTHRACENE, A MODEL FOR THE METABOLIC ACTIVATION OF CARCINOGENIC HYDROCARBONS. J. Am. Chem. Soc., 89(21):5508-5509, Oct. 11, 1967. ((15)) refs.

In the study of carcinogenicity of polycyclic aromatic hydrocarbons, there is a basic question of whether it is the hydrocarbon itself or some metabolite produced in vivo that is the primary trigger for biological activity. A chemical model system is described which is converting the potent 7,12-dimethylbenz(a)anthracene (DMBA) into biologically more active products. The action of one electron transfer agents, manganese dioxide, ferricyanide and Ce(IV) on DMBA was investigated. Fractionation of the manganese dioxide products yielded in addition to DMBA, five compounds, which were identified with several procedures. The biological activity of each was investigated using an E. coli bacteria phage assay.##

09055

Anghileri, L. J.

EFFECT OF OTHER HYDROCARBONS ON THE 'IN VITRO' BINDING OF 3,4-BENZPYRENE BY PLASMA PROTEINS. Naturwissenschaften (Berlin), 54(10):249-250, 1967. 1 ref.

The effect of other polycyclic hydrocarbons on the in vitro binding of 3,4-benzpyrene (3,4 BP) by plasma proteins has been assayed. The procedure is described. The plasma proteins albumin, alpha-globulin, and beta globulin, and radioactive 3,4-BP were combined with each of the following hydrocarbons: 1,2-benzpyrene, 1,2,3,4-dibenz-anthracene, 9,10-dimethyl-1,2-benzanthracene and 20-methyl-cholanthrene, then taken through the various assay procedures. The samples were finally counted in a liquid scintillation spectrophotometer. The distribution of 3,4, BP in the different plasma fractions was studied by starch gel electrophoresis. Under these experimental conditions the 20-ex decreases considerably the binding of 3,4 BP (approximately to 1/7 in albumin and to 1/5 in alpha and beta globulins). The other tested hydrocarbons decrease the binding in the following order of decreasing activity: DMBA; 1,2,3,4-DBA; Pyr; 1,2 BP.##

09063

Ludwig, John H.

SOME RAMIFICATIONS OF AIR CONTAMINATION. Public Health Repts. (U.S.), 75(5):413-419, May 1960. 4 refs. (Presented at the 47th National Safety Congress and Exposition, Chicago, Ill., Oct. 30, 1959.)

The ramifications of air pollution are discussed in terms of health effects, urbanization, and economic losses. Particulates, benzo(a)pyrene, sulfur oxides and photochemically reactive species are discussed.BC

09074

Lester, David and Leon A. Greenburg

ACUTE AND CHRONIC TOXICITY OF SOME HALOGENATED DERIVATIVES OF METHANE AND ETHANE. Arch. Ind. Hyg. Occupational Med., Vol. 3, p. 335-344, 1950. 8 refs.

The effect of inhalation of dichlorodifluoromethane, trichlorofluoromethane 1, 1-difluoroethane, 1-chloro-1,1-difluoromethane, 1,1-difluoroethylene, fluoroethylene, and 1,1-difluoro-1,2-dibromomethane were studied in rats. All of the compounds with the exception of vinyl and vinylidene fluoride are anesthetic. 1,1-difluoroethane, 1-chloro-1,1-difluoromethane and 1,1-difluoro-1,2-dibromomethane are pulmonary irritants. No damage to the liver was observed from inhalation of these compounds. The toxic effects of the compounds are discussed in relation to their boiling points. (Authors' summary, conclusion, modified)

09090

World Health Organization Expert Committee on Insecticides, Geneva, Switzerland

SAFE USE OF PESTICIDES IN PUBLIC HEALTH. (SIXTEENTH REPORT.) World Health Organ. Tech. Rept. Ser., No. 356:1-65, 1967.

The report of the WHO Expert Committee on Insecticides which met in Geneva, Switzerland, in September 1966 is presented. In vector control programs DDT has been in use for over 20 years. The concern that has been expressed in recent years about contamination of the environment by this very stable and persistent insecticide should not, in the opinion of the Committee, be considered sufficient reason for substituting other insecticides for indoor residual spraying against mosquitos. Where vectors have developed resistance to DDT it has become necessary to introduce alternative insecticides. The Committee reviewed those compounds and is of the opinion that with one exception - malathion (OMS-1) - those insecticides so far developed as indoor residual sprays are likely to present a greater hazard in use than DDT. The Committee urges health authorities to take a realistic view of the hazards presented by these new insecticides. The insecticides now under trial for use in vector control programs belong to the organophosphorus and

carbamate groups of anticholinesterases. Recovery from man-made poisoning by either type of insecticide will be complete, provided that prolonged asphyxia is avoided by proper treatment. While bearing in mind the importance of good public relations throughout a control or eradication program, the Committee considers that the demonstration of non-symptomatic enzyme depressions in the inhabitants of the sprayed should not preclude the use of entomologically effective compounds capable of controlling or eradicating malaria and other serious vector-borne diseases. The occurrence of symptoms with compounds of the carbamate group may indicate the need for a review of safety procedures and application techniques rather than for a discontinuation of the program. While the deliberations of the Committee were confined to compounds and procedures in use in public health, many of the points raised are applicable to some uses of similar compounds in agriculture and food storage.##

09316

Parker, D. B.

APPLICATION OF TRICHLOROACETIC ACID LEVEL IN URINE AS A MEASURE OF TRICHLOROETHYLENE VAPOR EXPOSURE. Sandia Corp., Albuquerque, N. Mex., 16p., July 1967. 7 refs.
(Publ: SC-R-67-451)

Trichloroacetic acid is a natural metabolite of trichloroethylene which is readily recoverable from urine specimens. The amount of trichloroacetic acid excreted in the urine is generally a function of the trichloroethylene vapor exposure. Although the day-to-day excretion levels fluctuate significantly, they can be used as an aid in evaluating an individual's exposure to trichloroethylene vapor when a series of samples are analyzed. (Author's abstract)

09435

Tye, Russell and Klaus L. Stenger

EXPERIMENTAL CARCINOGENESIS OF THE LUNG. II. INFLUENCE OF PHENOLS IN THE PRODUCTION OF CARCINOMA. Nat. Cancer Inst., 39(2):179-184, Aug. 1967. 8 refs.

After examining the contribution of the phenols to the pulmonary carcinogenic potency of the tar extract, a modest evaluation of the hydrocarbon carcinogens was made by mice. The acidic fractions (including phenols) were separated from two somewhat different coal tars. Various blends and an original tar produced aerosols to which 5 groups of male C3H/HeJ mice were exposed 1 hour, 3 times weekly, for 55 weeks. Animals were killed at intervals. The lungs and trachea of all mice were examined grossly and microscopically for neoplasms, or relevant morphologic changes. After 55 weeks, 13 survivors in groups 3 and 5, which received similar aerosols containing phenols, had 5 instances of adenocarcinoma, 12 of intrabronchial adenoma, and 10 of squamous metaplasia. Of 20 survivors of group 2, which received the same tar without phenols, there was no incidence of adenocarcinoma, 11 had intrabronchial adenoma and 7 had squamous metaplasia. (Authors' summary, modified)##

09660

McCarroll, James, Michael Lebowitz, Doris Walter, Eric Cassell and Donovan Thompson

AIR POLLUTION AND ACUTE RESPIRATORY ILLNESS. Preprint, Washington Univ., Seattle. School of Medicine. ([20])p.; 1967. (Presented at a joint meeting of the Pacific Northwest Section, American Industrial Hygiene Association and Northwest Association of Occupational Medicine, Portland, Oregon, Nov. 13, 1967.)

A three year study was conducted in New York City to determine what variations in the health of a normal urban population might be related to variations in their environment. The population studied included whites, Negroes, and Puerto Ricans from upper, middle, and lower income groups, and was divided into four categories: children (those under 15 years of age); adults; heavy cigarette smokers; and non-cigarette smokers. The total number of participants in the study was 1797 and each was observed for an average of 55 weeks. A questionnaire was developed containing approximately 100 items regarding variations in health. Each family was visited each week by a trained health interviewer who orally asked the questions in the questionnaire; questions were asked for each of the seven preceding days. An air pollution monitoring station was established in the center of the study area and measurements were made of SO2, particulates, carbon monoxide, and hydrocarbons. Also, monitoring records of a variety of other pollutants were obtained from the City. Continuous records were maintained on common meteorologic variables. The association between the daily prevalence rates of various health symptoms and the levels of air pollutions are examined by several methods. The multiple correlation coefficients and the multiple regression coefficients of some of the symptom prevalence rates with air pollutants and meteorological factors are summarized. It is concluded that: a) there are associated relationships between symptoms in a normal urban population and a variety of environmental factors and b) no one factor, including air pollution, acts alone to produce most of the common illnesses.##

09713

Reinecker, H., H. Tonigan, and H. P. Weisfeld

UNTERSUCHUNGEN UEBER STAUB-VERURSACHTE SCHAEDEN, INSBESONDERE KANZEROGENE EFFEKTE. BEITRAG 6: UNTERSUCHUNG DER LUNGEN VON MENSCHEN MIT STAUB- UND RUSSPNEUMOKONIOSE IN DER HEIDELBERGER AREA. (Untersuchungen ueber die Schadlichkeit von Staub unter besonderer Beruecksichtigung ihrer cancerogenen Wirkung. 6. Mitteilung: Untersuchung von Lungen mit Staub- und Russpneumokoniose in der Heidelberger Area.) Text in German; Auth. Eng. Statistical. (Munich), 15(7):668-688, Nov. 1967. 3 refs.

This continuation of a study of the industrial area around Heidelberg concerns only the dust levels in the lungs. The lungs of 10 persons (aged 39-73) who had lived most of their lives in the Heidelberg area were autopsied. Similar to findings in previous work, traces of benzpyrene occurred in 9 cases. Dust content ranged from 0.39-1.38 g. in 9 cases, the tenth exhibiting 3.38 g. (average of 9, 0.93 g.).

09985

Dyhan, Arthur A. and Juanita H. Landes

TOXICOLOGY OF BORON HYDRIDES--STUDIES OF ALTERATIONS IN TISSUE AMINES TOXIC DECABORANE-14 (B10H14) AND PENTABORANE-9 (B5H9) AS MODIFIED BY HYDRAZINES AND PROPYNYLAMINES. Air Force School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Div., Task 6301207, SAM-TDR-66-113, 10p., Dec. 1966. 20 refs. (PUBL,DDC: AD 646817)

Investigations of the influence of the toxic boron hydrides, decaborane-14 and pentaborane-9, on biogenic amine metabolism were undertaken to assist in the elucidation of the toxic mechanisms and sites of action of boron hydrides in animals. Brain and heart tissue serotonin and norepinephrine were found to be significantly depleted after treatment of test subjects with the boron hydrides. The testing of a number of potential antidotes for the treatment of the toxic symptoms and biogenic amine changes due to exposures to boron hydrides has resulted in the discovery of several new antidotal drugs for the toxic effects of decaborane-14. Pargyline (N-methyl-N-benzyl-2-propynylamine), a potent nonhydrazide monoamine oxidase (MAO) inhibitor, provides protection against the depletion of rat brain and heart norepinephrine, as well as the reserpine-like sedation and ataxia observed in decaborane-intoxicated rats. In contrast, several close analogs of pargyline do not protect against the depletion of tissue norepinephrine due to decaborane poisoning. JB-516 (1-phenyl-2-hydrazinopropane), a potent hydrazine-related MAO inhibitor, greatly potentiates the toxic effects of decaborane-14, as does Iproniazid (1-isonicotinyl-2-isopropyl hydrazine). Some of the B6-vitamin pyridoxine also appear to counteract the toxic effects decaborane-14. Monoamine oxidase inhibition and elevation of tissue amines per se by a drug do not appear to be required properties for the drug to decrease or eliminate the toxic actions of boron hydrides. Followup studies, which include investigations of the mode of action of pargyline and pyridoxine as protective agents in boron hydride-intoxicated animals, are in progress. (Authors' abstract)

10105

R. Vasudevan, D. H. Curnow, P. B. Forte, V. Stone

STORAGE OF ORGANOCHLORINE PESTICIDES IN THE BODY FAT OF PEOPLE IN WESTERN AUSTRALIA. Ind. Med. Surg., 37(4):295-300, April 1968. 37 refs.

Between Dec 1965 and November 1966, 58 samples of human adipose subcutaneal tissue were collected from routine autopsies in Perth, Australia. None of the persons aged 14 to 83, with 83% above 50 years, had any known occupational exposure to pesticides. In 46 specimens analyzed by the Schechter-Haller spectrophotometric method, the average concentration of total DDT-derived material was 9.4 plus or minus 7 ppm. The mean value of DDT was 3.8 plus or minus 4 ppm, and of DDE was 5.9 plus or minus 7 ppm. DDE averaged 62% of the total DDT-derived material. In 12 samples analyzed by gas-liquid chromatography, the average concentration of total DDT-derived material was 6.3 plus or minus 7 ppm. Isomers of BHC averaged 0.68 ppm and dieldrin 0.67 ppm. Comparable data from Canada, America, Czechoslovakia, England,

France, Germany, Hungary, Spain, India, and Israel are tabulated. The average concentration of dieldrin found in body fat of Western Australians (0.07 plus or minus 0.1 ppm) is rather high when compared with values found in other populations (0.003-0.31 ppm).00

10118

Weste, J. D., J. L. Lassiter, and D. J. Weber

HYDROCARBONS FOUND IN WAXY LAYERS FROM SPORES OF BASIDIOMYCETES. Preprint, Houston, Univ., Tex., 118/ p., (1968). 10 refs.

Paraffinic material was extracted from spores of six basidiomycetes and analyzed by gas chromatography. The individual hydrocarbons were characterized as the eluted from the chromatographic column by a combustion gas chromatograph-mass spectrometer. The hydrocarbon pattern was distinct for each species analyzed with odd-chain hydrocarbons predominating in every case. The predominate n-alkane peaks were: C27 for Ustilago maydis, C29 for Puccinia graminis, C29 and C31 for Hirneola auricula, C27 and C31 for Ustilago avena, C29 and C31 for Ustilago avenae, and C29 for Sphaerotheca fuliginea. The concentration of normal and branch- chain hydrocarbons varied from 4 ppm to 140 ppm. The hydrocarbons are part of the waxy outer layer of spores and the significance of this layer is discussed. (Authors' abstract)

10119

Wehlig, H.

PATHOLOGICAL SYMPTOMS DUE TO INHALATION OF ASBESTOS DUST. (Krankheitserscheinungen nach Asbeststaubinhalation.) Text in German. Staub, Reinhalt. Luft, 28(12):503-505, Dec. 1968.

In a brief literature review, in which authors are mentioned but no references cited, the problem of asbestos dust as a carcinogenic substance is surveyed. Despite greatly increased preventive measures taken in many asbestos plants, and the resultant reductions in cases of asbestosis, problems of asbestos inhalation have acquired new significance during the past five years. The retrospective examination of mesothelioma autopsy material in various countries has implicated asbestos dust as a malignant-tumor inducing agent, not only in asbestos workers but even in others. The well-known 'pleura-plaques' of asbestosis and diffuse mesotheliomas have been observed in individuals who had never had occupational contact with asbestos but who had resided in the vicinity of asbestos plants or mines. It can be stated with assurance that pollution of the ambient air (emission) by asbestos factories - which were relatively late in utilizing the asbestos dust of their dedusting installations instead of simply releasing it to the atmosphere - has been a causative factor in a significant increase in the rate of appearance of both pleural plaques and mesotheliomas. Whether or not the quantities of asbestos dust released into the atmosphere from brake linings of automobiles are also responsible for these malignancies is a question which has yet to be determined; however, asbestos was detected histologically in the lungs of city dwellers not exposed occupationally to the

following percentages: Pittsburgh, 41.7%; Miami, 27.9%; Cape Town 26.4%. Individuals endangered by asbestos, in addition to those just cited, include persons who have occasional contact with asbestos in construction or other activities (such as roofers, insulation specialists). The properties of asbestos dust, including their benzopyrene content, are briefly mentioned.00

10261

Cuthbert, J.

THE COMMUNITY HAZARDS OF ASBESTOS. [Die Gefahren des Asbest für die Allgemeinheit.] Text in German. Munich, Med. Wochschr. (Munich), 109:1363-1372, April-June 1967.

The inhalation of asbestos is far more dangerous than is generally recognized by the public, since even a transient period of exposure can lead to disease (interstitial fibrosis of the lung, lung cancer, mesothelioma, endothelioma of the pleura and the peritoneum, painful dermal warts) and death many years later. Electron microscopic studies have shown that for every asbestos fiber recognizable under an ordinary (light) microscope, there are hundreds of tiny unrecognized particles, which dust experiments with guinea pigs have shown to be just as deadly as the larger fibers. While the asbestos industry has taken energetic measures toward the prevention of classical forms of asbestosis by dust elimination in the plants (vacuum removal of the dust, use of gas masks, automation of manufacturing processes), such prophylactic measures have not prevented the gradual long-term development of cancer in persons who come into occasional, slight, or temporary contact with asbestos. This group certainly includes wives of asbestos workers and all persons living within 1.5 km. of an asbestos plant; these persons tend to succumb to mesotheliomas after many years of such contact. A number of examples are given, including those of carpenters and construction workers, who do not realize that their relatively brief contact in sawing or handling asbestos materials can lead to lung cancer many years later. The great increase in asbestos production and in absolute (not per capita) figures is tabulated; the need for utilization of alternate materials in industry, and for further research on biological effects is emphasized. The presence in asbestos of carcinogenic pile and other components, including benzopyrene and chrysene, is mentioned. 00

10956

Mayne, Lowell G. and Leslie A. Chambers

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. Arch. Environ. Health, 16(6):871-885, June 1968. 14 refs.

Rodents exposed to the ambient atmosphere of Los Angeles throughout their lives have been studied in comparison with animals maintained in soot-filtered atmospheres. In aging inbred mice of certain strains, there was an increased incidence of pulmonary adenomas. In one strain mortality of males but not females during the first year of life was increased. Severe soot episodes caused lung tissue alterations at the ultrastructural level, especially in mice older than 15 months. Severe episodes produced transient

increases in pulmonary resistance in old guinea pigs but no demonstrable chronic or cumulative effects on this parameter. In guinea pigs immobilized by prior stress treatment, urinary excretion of 17-ketogenic steroids was enhanced by ambient atmosphere exposure. After two or three years of exposure, rabbits exhibited reduced activity of glutamic oxaloacetic transaminase in blood serum. (Authors' abstract)

10613

Anthony A. Thomas

SPACE CABIN TOXICOLOGY. In: NASA, Marshall Space Flight Center 5th Annual Meeting, Air Force Systems Command, Wright-Patterson AFB, Ohio, p. 207-217, March 3, 1967.
10 refs.
NASA: N68-17389

Space cabin toxicology is a new and challenging area of research in life support. The unique problem of this branch of toxicology is the truly uninterrupted continuous nature of exposure to chemical toxicants. Fundamental research in the last two years has answered the following most urgent basic questions. Continuous exposure can lead to a "summation of interest" type of toxic effect because daily recuperative periods from exposure are non-existent. The exotic atmospheric environment can influence the outcome of toxic damage; reduced barometric pressure and oxygen-rich atmosphere are influencing factors. All cabin materials can and must be screened by analytical and biological methods to increase the health and performance of the crew in future manned space stations. To answer these questions, experiments were conducted with animals in controlled atmosphere chambers at reduced pressure. Various containment materials were introduced for long exposures times. The tests themselves lasted up to eight months, thus giving a good indication of the effects of long-term exposure to a "space cabin" atmosphere.##

10987

Mountain, Isabel S.; S. J. Connell, Doris E. Walter, J. D. Mountain, Judith E. Diamond, and J. E. Sutherland

HEALTH AND THE URBAN ENVIRONMENT. VII. AIR POLLUTION AND DISEASE SYMPTOMS IN A "NORMAL" POPULATION. Arch. Environ. Health, 17(3):343-353, Sept. 1968.

The effect of each of several pollutants on the health of urban families on the lower East Side of New York City has been assessed. Prevalence of certain symptoms on one day of the week (Monday) was assessed according to level of each pollutant (low, medium, or high). Prevalence was treated as a binomial variable (number of "yes" responses/number of "yes" and "no" responses), whereas pollutant level was a continuous variable (but ordered, by tertile), according to the method of Armitage. In women, in children under 5 years of age, prevalence of respiratory symptoms was directly related to increasing levels of particulate matter and of carbon monoxide. (Authors' abstract)##

11581

E. M. Roth, W. H. Vaichner, and A. G. Hirarchi

CONTAMINANTS STANDARDS. (SECTION 12.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT NAS-119, p. 1-119, Nov. 1968. 233 refs.
CFSTI: NASA CR-1205(III

Toxicological problems in space operations cover three situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; sources of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.##

11589

Stout, E. M., Jr. and Roger K. Flora

KANAWHA VALLEY AIR POLLUTION STUDY HEALTH EFFECTS. II. CONDUCTION OF THE STUDY. Progress, West Virginia Univ., Morgantown, Div. of Allergy and Div. of Preventive Medicine, (1968Sep., (1968??))

A method for obtaining information concerning the eye and nasal symptoms of a sample of hypersensitive persons by daily telephone calls was explored. These symptoms were correlated with air pollution measurements taken within one half mile of the residence of these reactors. Pollutants measured were sulfates, soluble benzene compounds, and particulates. Results showed that 35% persons studied reported repeated nose symptoms and 22% reported eye symptoms. A history of bronchitis was obtained in 21%, but 60% brought up phlegm several times a year. Asthma was reported by 3% and 53% had a history of dyspnea. Thirty-seven per cent had allergies, 16% of these having had allergy skin tests.##

11260

Stout, B. M., Jr. and Roger R. Flora

KANAWHA VALLEY AIR POLLUTION STUDY HEALTH EFFECTS. III. SYMPTOM RESPONSE TO DAILY MEASURES OF AIR POLLUTION. Preprint, West Virginia Univ., Morgantown, Dep. of Allergy and Preventive Medicine, ((2))p., ((1966)) 3 refs.

Daily surveys were made on persons living in the Kanawha Valley W. Virginia for effects of particulates, sulfates and benzene soluble compounds of the eyes and nose. The "Kanawha Valley" contains industrial plants where the products are synthetic rubber, urethane foam, vinyl, sulfuric acid, solvents, agricultural chemicals, ammonia, anti-freeze, chlorine and its derivatives, paint components, organic esters, plasticizers, polyethylene, rayon, adhesive yarn and formaldehyde. No indication of positive correlation of symptom prevalence with levels of pollution as measured in this study could be detected.##

11261

Stout, B. M., Jr. and Roger R. Flora

KANAWHA VALLEY AIR POLLUTION STUDY HEALTH EFFECTS. I. DESIGN OF THE STUDY. Preprint, West Virginia Univ., Morgantown, Dep. of Allergy and Preventive Medicine, ((14))p., ((1966)) 13 refs.

A method for studying human response to air pollution was explored. Hypersensitive reactors to air pollution were selected for the study. Daily information on symptoms involving the eye and nose were obtained by telephone interviews from persons living in the valley under study in W. Virginia. An outline of plans for the study was: 1) to obtain a panel of hypersensitive reactors; 2) to follow these reactors through 12 months prospective study by daily contact by telephone interview; 3) to correlate their reactions with certain measurements of daily air pollution.##

11272

Anatnakanyan, A. V.

EFFECT OF LOW CONCENTRATIONS OF CHLOROPRENE IN THE ATMOSPHERE ON SUPRARENAL FUNCTION IN CHILDREN. Hyg. Sanit. 31(1):115-117, Jan. 1966. ((7)) refs.

The qualitative and quantitative composition of alcohols contaminating the air around factories producing synthetic fatty alcohols and synthetic fatty acids, is described for the first time. Such air may contain volatile lower alcohols, as well as less volatile higher alcohols. Since aliphatic alcohols differ in their toxic properties, the maximum permissible atmospheric concentration should be established for each alcohol separately.##

11275

Kotin, P.

THE INFLUENCE OF PATHOGENIC VIRUSES ON CANCERS INDUCED BY INHALATION. Public Health Service, Bethesda, MD. National Institutes of Health, pp. 485-500, (1958?). 27 refs.

Squamous carcinomas were induced in 650 Black mice after successive infections with three mouse-adapted strains of influenza virus and continuous exposure to an aerosol of unsaturated gasoline. The progression of the pathological process, from the initial proliferative response, to influenza virus, through squamous metaplasia with keratinization, to the development of squamous cancer, has been histologically described. The last two classes of change were observed exclusively in mice concurrently exposed to the influenza virus and hydrocarbon aerosols.##

11276

Brucker, T. Timothy and B. J. Nielsen

PRIMATE, CANINE AND RODENT TRACHEOBRONCHIAL EPITHELIAL RESPONSE TO POLYCYCLIC HYDROCARBONS AND AIR POLLUTANT EXTRACTS IN ORGAN CULTURE: A PROGRESS REPORT. Preprint, California Univ., San Francisco, Cancer Research Inst., 15p, 1958. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-25, 1958, Session III: Pathogenetic Role of Atmospheric Pollutants, Paper 7.)

Chemicals known to cause experimental lung cancer in lower animals are present in urban air, tobacco smoke, automobile exhausts and industrial smoke. In order to learn whether man (or other primates) can be expected to be more or less susceptible than rodents or canines upon exposure to these materials, a test system is needed that would expose respiratory mucosa of all species to the suspected chemicals, under uniform conditions. Tracheobronchial structures of rodents, dogs and monkeys were maintained for 2 to 3 weeks in organ culture. Polycyclic hydrocarbons known to be carcinogenic by various methods of testing in rodents were added to organ culture media and produced abnormal histologic states of respiratory epithelia. Among these are: (1) basal cell hyperplasia, (2) replacement of differentiated columnar cells either by one or more layers of undifferentiated pleomorphic cells or by stratified cells of a squamous epithelial type, (3) excessive height and crowding of columnar cells to form redundant epithelial folds, and (4) loss of all or most epithelial cells. Weakly carcinogenic and non-carcinogenic hydrocarbons did not produce these abnormal states. Whole benzene-soluble extracts of solids from filters used to collect air pollutants were applied in this system, and one or more of the abnormal states described above were induced. Effects of benzo(a)pyrene and of a composite of air pollutant extracts are compared in evaluating the biologic responsiveness of rodent, canine and primate respiratory epithelia to a pure compound or a crude extract of material under consideration as having possible effects on health.##

11307

Smith, L.G. and R.L. Plata

DEPRESSION OF NURSING ACTIVITY IN MICE BY EXPOSURE TO POLLUTED AIR. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center; 12p., 1968. 6 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-26, 1968, Session IV: Animal Toxicology, Paper 4.)

Mice in activity wheels were exposed continuously to diluted raw or irradiated and unirradiated Auto exhaust for a period of 8 weeks, using a diurnal cycle simulating Los Angeles conditions in heavy smog. Those in irradiated exhaust showed an immediate depression greater than those in raw exhaust, each gradually recovering and finally surpassing the controls by the end of the experiment. A balanced half each of control and irradiated exhaust groups was switched to the other exposure for the second 8 weeks. The controls later placed into irradiated exhaust ran significantly less than any other group. On a daily basis, no significant treatment effects were found although the LAP males always ran significantly (P less than .01) farther than their DALB chamber mates. The exhaust atmospheres appeared to modify the diurnal cycles of activity, generally flattening the usual night peak, but no detailed analyses were made. The mice exposed to unburned gasoline fumes gradually recovered their control level of activity when continually exposed for several weeks. With this background of experience, sound activity was included as one measure of the effects of ambient air pollution exposure.##

11309

Fukihara, S.; D. H. Bowden; V. Fisher; and J. P. Wyatt

THE EMPHYSEMA PROFILE IN TWO NORTHERN CITIES IN NORTH AMERICA. Preprint, Manitoba Univ., Winnipeg, Dept. of Pathology and Saint Louis Univ., Mo., Dept. of Anatomy, 11p., 1968. 7 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-26, 1968, Session VI: Emphysema, Paper 3.)

In a comparitive study there was considerably more emphysema in St. Louis than Winnipeg and the anatomic emphysema was found much earlier and appeared to progress more rapidly. In neither city were cases of severe emphysema observed in non-smokers. From these basic observations on these two cities, which have striking differences in the degree of environmental pollution, it appears that smoking is not the only factor concerned in the development of emphysema. The importance of environmental pollution is further strengthened by the fact that the incidence of severe emphysema in comparable groups of cigarette smokers in four times as high in St. Louis as it is in Winnipeg. These findings suggest that the development of emphysema may be related to a synergistic effect of smoking and environmental pollution. The sharp distinction between the emphysema profiles of these two cities further emphasizes the epidemiologic value of correlating various parameters of urban living with patterns of lung pathology.##

11925?

Dubrovskaya, F. V., M. N. Kotsenelenbaum, Ya. K. Vankka, G. V. Kulyashev, and V. A. Korolova

ATMOSPHERIC AIR POLLUTION WITH DISCHARGES FROM SYNTHETIC FATTY ACIDS AND ALCOHOLS PRODUCING INDUSTRIES AND THEIR EFFECT ON THE HEALTH OF THE POPULATION. [Atmosfernyy vozdukh s vybrosami proizvodstva sinteticheskikh zhirnykh kislot i spirtov i vliyanie ikh na zdorov'ye naseleniya.] Translated from Russian. Gigiena i Sanitariya, 26(12):3-8, Dec. 1961. 5 refs.

Investigations of the atmosphere in Shebekino have revealed it to be intensely polluted up to a radius of 3 km from a synthetic fatty acids and alcohol plant in the Shebekino Industrial Complex. The discharges contain fatty acids, hydrocarbons, acetone, methanol and formaldehyde. Investigations showed that that combustion of exhaust gases occurred at low efficiency, with hydrocarbons, acids and acetones only 30% burned. The concentrations of pollutants in escaping gases, and of saturated and unsaturated hydrocarbons, ketones, acetone, and fatty acids in atmospheric air, are tabulated. Construction inadequacies of the furnace used were blamed for the low efficiency of combustion. A complete medical examination of the children in Shebekino showe their health to be somewhat affected by the atmospheric pollution. Diseases of respiratory tract prevail among other affections. It has been determined experimentally that the threshold value of olfactory perception of valeric acid in most people fluctuates from 0.5 to 1.0 mg per m3.00

11926

Krasovitskaya, M. I., and L. K. Malyarova

LONG-TERM EFFECT OF LOW CONCENTRATIONS OF ETHYLENE AND TRICHLOROETHYLENE ON NEWBORN ANIMALS. [O khronicheskom deystvii malykh kontsentratsiy etilena i trikhloretilena na organizm novorozhdennykh zhivotnykh.] Hyg; Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):166-169, April-June 1968. (10) refs.
(PB181 99 66-50446/2

Adult albino rats (aged 2 1/2 months) and newborn ones, respectively designated as series I and II were exposed to ethylene and trichloroethylene continuously for 90 days. The experiment included 12 groups of rats, 12 to 15 animals in every group. Animals of both series were exposed to identical concentrations (3 and 1 mg/cu m ethylene; 5, 1 and 0.5 mg/cu m trichloroethylene). Adult animals weighing 110-130 g were used in series I and newborn rats were used in experimental series II. The initial physical development parameters of the newborn animals were practically the same. By the fifth day of exposure the weight increments in all the experimental groups (8.7-9.8 g) differed significantly from those in the controls (7.0-7.6 g). A statistically significant difference in weight persisted throughout the exposure in all the experimental groups, with the exception of animals exposed to trichloroethylene in a concentration of 0.5 mg/cu m. The experimental animal's physical development also lagged somewhat with respect to the appearance of the coat.

dentition, and the opening of eyes. From the age of six weeks, series II animals exhibited definite changes with respect to other indices also. Blood pressure measurements revealed hypotension in animals exposed to 1 and 4 mg/cu m trichloroethylene. The experimental animals also exhibited changes in subordinative chronaxy. Inversion of the chronaxic ratio between flexors and extensors was found in animals exposed to 3 mg/cu m ethylene and 4 and 1 mg/cu m trichloroethylene. A change in the cholinesterase activity of whole blood was found in animals exposed to 3 mg/cu m ethylene and 4 and 1 mg/cu m trichloroethylene during the last stages of the exposure period. All these indices returned to normal following a recovery period. Observations of physical development showed that the effect of poisonous substances on newborn rats became obvious in the earliest stages of exposure. The adult experimental animals did not differ from the controls with respect to weight even on exposure to relatively high concentrations.##

11469

Gol'dbery, M. Ya.

BIOLOGICAL EFFECTS OF ATMOSPHERIC POLLUTANTS AND HYGIENIC STANDARDS FOR ATMOSPHERIC POLLUTANTS OUTSIDE THE USSR.
[Problema biologicheskogo deistviya atmosfernykh zagryaznenii i ikh gigienicheskoye normirovaniye za rubezhom.] (In Russian) Moscow, Meditsina, [English translation of: Gigiena i sanit.], 33(6-8):245-250, April-June 1968. [13] refs.
CFSTI: TT 68-50049/3

A brief discussion is presented of a few achievements in the biological effects of pollutants and standards in the U.S.A., Great Britain, and Germany. Studies being conducted on the effects on man of prolonged exposure to low concentrations of atmospheric pollutants are mentioned. Air pollution episodes in New York (1963) and London (1952) are briefly mentioned. Also discussed is the problem of the effect of the dispersity of dust particles containing 3,4 benzpyrene upon carcinogenic activity.##

11519

MacEwen, J. D. and E. F. Eschler

COMPARATIVE STUDIES OF 90-DAY CONTINUOUS EXPOSURES TO O2, NO2 AND CCl4 AT REDUCED AND AMBIENT PRESSURES. (Final Report.)
Aerojet-General Corp., Azusa, Calif., Contract AF 33(657)-11105, Proj. 6302, Task 630201, AMRL-TR-67-88, 47p., Feb. 1968. 25 refs.
CFSTI, DDC: AD 669079

Ninety-day continuous animal exposures to ozone, nitrogen dioxide and carbon tetrachloride at threshold limit values were conducted under ambient pressure and 100% oxygen-reduced pressure (5 psia) conditions. Four species, dogs, monkeys, rats, and mice were exposed to each material. Guinea pigs were also used for ozone exposures due to their reported susceptibility to this pulmonary irritant. Minimal biologic responses were observed with exposure to each of the compounds tested and, consequently, lower tentative exposure limits are recommended for space cabin

environments. The recommended limits, based on the time period tested, are 1 ppm for nitrogen dioxide, 0.01 ppm for ozone, and 0.5 ppm for carbon tetrachloride. (Authors' abstract)##

11593

Thomas, A. A.

MAN'S TOLERANCE TO TRACE CONTAMINANTS. Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio, AMRL-TR-67-146, 38p., Jan. 1968. 8 refs.
(Prof; DDC: AD 669158

Atmospheric contaminants in sealed cabins originate from a multitude of sources: off-gassing from cabin materials, production of contaminants by the life support system components, continuous exposure, a combination of physiological stress from problem increases with progressing mission duration and can become the limiting factor for man's tolerance to extended space flight, several important aspects must be considered; truly uninterrupted, continuous exposure, a combination of physiological stress from the use of artificial atmospheres and the chemical stress imposed by the trace contaminants, and the great potential of synergistic toxic effect by various constituents of the highly complex mixture of many contaminants. Superimposed on these factors are the other aggravating characteristics of prolonged space flight: logistics problems of life support and psychological effects of isolation on performance. Clearly, these factors must be weighed singly and in combination to allow safe design of future manned systems. Validation of human tolerance to trace contaminants can be accomplished by prolonged animal exposures coupled with mathematical model verification. Tradeoffs in life support system design can extend tolerance to contaminants and long range logistic tradeoffs should be considered by utilizing extra-terrestrial resources for contaminant removal purposes. (Author's abstract)##

11641

Vaughan, Thomas R., Jr.; Louis F. Dennelle and Trent B. Lewis

EFFECTS OF CHRONIC EXPOSURE TO LOW LEVELS OF AIR POLLUTANTS ON PULMONARY FUNCTION IN THE BEAGLE. Preprint, Public Health Service, Cincinnati, Ohio National Air Pollution Control Administration, ((19))p., ((1968)). 20 refs.

One hundred and four beagles have been exposed for 18 months to natural and photochemically reacted auto exhaust, oxides of nitrogen and oxides of sulfur. No differences in single breath carbon monoxide diffusing capacity, dynamic pulmonary compliance or total expiratory pulmonary resistance were found between exposed and control animals. Removal of reactive gases in the upper airway was studied during brief exposures in an additional small group of animals. Under these conditions, 100% removal of O3 and SO2, 90% removal of NO2, 7% removal of NO and no removal of CO or hydrocarbon were found. (Authors' abstract)##

11682

11682
Alvin Feinstein, Mohammad Asgnat and Norman D. Weiner

INTERACTION OF PROTEIN AND LIPOPROTEIN MONOLAYERS WITH NITROGEN DIOXIDE-TRANS 2-BUTENE GASEOUS MIXTURES. Preprint, Columbia Univ., New York, Coll. of Pharmacy, ((6))p., ((1960)). 9 refs.

The interactions of pollutant atmospheres with oriented protein and lipoprotein films was studied. A gas train assembly, Teflon coated trough, and Wilhelmy plated method of surface pressure measurement was used. The films were then exposed to a standard atmosphere (i.e., air flowing at the rate of 300 ml/min) or to the following test atmospheres, all flowing at this same rate of 300 ml/min: (a) 0.1% nitrogen dioxide in air; (b) 0.05% trans 2-butene in air; and (c) 0.1% nitrogen dioxide and 0.05% trans 2-butene in air. Significant changes in the -A curves for the pure protein films were observed in the presence of all atmospheres containing nitrogen dioxide, while the trans 2-butene did not interact with the film, nor did it appear to influence the nitrogen dioxide film interaction. However, whereas exposure of unsaturated phospholipid films to nitrogen dioxide containing atmospheres resulted in a large expansion of the film, exposure of bovine albumin film to these same test atmospheres resulted in a significant contraction of the film. The data obtained suggest that the effect of NO2 on the lipoprotein films studied, appears to be a function only of the phospholipid component of the film. In general, membrane lipoproteins contain a large proportion of unsaturated phospholipids attached to structural and functional protein. In vivo interaction of the supporting phospholipid with nitrogen dioxide, or other reactive pollutants, could result in an expansion of the exposed cell membrane. This expansion would then lead to a change in the conformation of the attached protein. In the case of a functional protein, changes in conformation would be accompanied by changes in enzyme activity.##

12175

L. R. Jaffe

EFFECTS OF CHEMICAL MUTAGENESIS. Preprint, Public Health Service, Washington, D. C., Div. of Air Pollution, ((10))p., Oct. 8, 1963. 10 refs.

Chemical mutagenesis is the process whereby the somatic cells of an organism are induced to produce a change (mutation) by chemical means or by exposure to chemical substances, wherein as a result of this exposure the cell themselves or the daughter cells, formed upon dividings, function less efficiently or differently from the parent cells. In chemical mutagenesis we are concerned with the influence of certain chemicals found in air pollution to form deleterious mutations in the somatic cells of the individual (or animal population) causing it to age more quickly; to change the appearance and nature of the cells anatomically or in function; or to act carcinogenetically and form cancers in the organism. The prime effects of chemical mutagenesis are of three broad categories: (1) a change in the aging process induced by chemical means; (2) change in the nature and appearance of the cell and/or its function (teratogenic); (3) carcinogenesis.##

12272

Yelishchev, Y.

TOXICITY OF ETHYLENE OXIDE IN LOW CONCENTRATIONS. In: The Biological Effects and Hygienic Importance of Atmospheric Pollutants, Book 10. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 17, pp. 31-36, 1968.
CFSTI: PB 180S227

In exposure tests ethylene oxide (EO) as a poison affected all body organs and systems, principally the central nervous system. The EO odor perception threshold for most sensitive test persons was found to be 1.5 mg/cu m; threshold eye sensitivity to light 1.0 mg/cu m; and threshold of electrical cerebral activity 0.65 mg/cu m. It is recommended that 0.3 mg/cu m of EO adopted as the limit of its maximum concentration in atmospheric air. Chronic, 24-hr. exposure of white rats to the inhalation of air containing 0.3 mg/cu m of EO for 45 days produced changes, affected the animals' liver-extensor chronaxy ratio and the chloride and residual nitrogen blood contents. It is suggested that the average daily maximal allowable EO concentration in atmospheric air be set at 0.03 mg/cu m. (Author's conclusion, modified) GS

12276

Sunov, I. B.

COMPARATIVE TOXICITY STUDIES OF BENZENE, TOLUOL, AND STYOL BY THE REFLEX ACTIVITY METHOD. In: The Biological Effects and Hygienic Importance of Atmospheric Pollutants, Book 10. Translated from Russian by B. S. Levine, U.S.S.R. Literature on Air Pollution Occupational Diseases, Vol. 17, pp. 60-67, 1968.
CFSTI: PB 180S227

The odor threshold and the effect on brain electropotentials of benzene, toluene, and xylene were determined. Experimental methods used are described. The author proposes the following conclusions: (1) Odor perception thresholds decreased with increase in the number of methyl groups in the benzene ring. Odor thresholds were: 2.8 mg/cu m benzene; 1.5 mg/cu m toluene; and 0.6 mg/cu m xylene. (2) Concentrations of odor perception thresholds used as indexes in evaluating effects on cerebral electrical activity decreased benzene, toluol, xylol in the following order: (3) Benzene and toluol enhanced the electrical potentials, while xylol had the opposite effect, causing a decrease in the electrical activity of the cerebral cortex. Return to normal electrical brain activity in toluol and xylol poisoning proceeded slowly. (4) 1.5 mg/cu m of benzene, 0.6 mg/cu m of toluol, and 0.3 mg/cu m of xylol are subthreshold concentrations as shown by results of electrical potential brain tests. These concentrations are recommended as maximal permissible single-exposure concentrations for atmospheric air. (Author's conclusion, modified) GS

12285

Gusev, M. I. and A. A. Rikayev

AN EXPERTS STANDARDIZATION OF ALPHAMETHYLSTYRENE IN ATMOSPHERIC AIR. In: The Biological Effects and Hygienic Importance of Atmospheric Pollutants, Issue 10, Translated from Russian by B. S. Levine, U.S.D.H.E. Literature on Air Pollution and Related Occupational Diseases, Vol. 17, pp. 139-145, 1968.
(PB180339)

The toxic effects of alphamethylstyrene (AMS) were investigated, and the maximum average-daily allowable concentration of this vapor was determined in experiments using white rats. On the basis of the data obtained, it is concluded that: (1) Alphamethylstyrene vapors in concentration of 3 mg/cu m and lower had no effect on the behavior, weight, and general blood picture (leucocyte, erythrocyte, hemoglobin count) of the test animals. (2) An AMS concentration of 3 mg/cu m depressed the central nervous system (increased reflex time), altered the bio-chemical reactions (reduced the content of ascorbic acids in the blood and of coproporphyrin in the urine), and changed the luminescent properties of the leucocytes. Functional changes were confirmed by pathohistological changes in lungs, liver, heart, and kidneys. (3) In concentration 0.3 mg/cu m AMS altered mg/cu m had no effect. (4) The maximum average tolerance allowable concentration of AMS vapors in atmospheric air can be set at the level of its accepted single-exposure allowable concentration of 0.04 mg/cu m which is the inactive level in chronic inhalation exposure of the experimental animals.

12500

Weiss, H.

THE INITIAL LUNG CLEARANCE OF DI-DISPERSE (2 MICRON AND 7 MICRON) POLYSTYRENE PARTICLES IN RABBITS. Arch. Environ. Health, 17(6):871-873, Dec. 1968. 3 refs.

The difference in the simultaneous initial course of lung clearance of 2 micron and 7 micron monodisperse polystyrene particles has been studied in rabbits. This lung function was registered with a fixed detector system during the first two hours after the animals had been exposed to the test aerosol via a tracheal tube. The results point out the importance of frequent and early data of the lung retention of studied particles for the evaluation of the function of lung clearance. (Author's Abstract)GS

12955

Peters, John M., Jere Reed, and Wilma F. Van Ganse

A SIMPLE FLOW-VOLUME DEVICE FOR MEASURING VENTILATORY FUNCTION IN THE FIELD. RESULTS ON WORKERS EXPOSED TO LOW LEVELS OF TOLUENE DIISOCYANATE. Am. Rev. Respirat. Diseases, 99(6):1017-1022, 1969. 10 refs.

A new, simple, portable device for measuring the maximum (expiratory flow-volume (MFV) curve was discussed. The ventilatory capacity of 25 workers exposed to toluene diisocyanate was assessed with this device. Measurements were made on Monday morning and afternoon, and on Tuesday morning. The results showed a significant qualitative and quantitative depression of the MFV curve during the working day which did not return to baseline levels on Tuesday morning. This device is well suited for survey work in the field and is particularly useful when serial measurements of the same individual are made. (Author summary modified)

12969

Golubev, A. A.

EFFECT OF CERTAIN INDUSTRIAL IRRITANTS ON CHANGE OF PUPIL DIAMETER IN THE RABBIT. [Ob izmenenii diametra zrachka krolika pod vliyaniem nekotorykh promyshlennykh yadov gazoobraznogo deystviya]. Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 8:58-59, 1969.

The effects on pupil size in the rabbit were determined over a 30-min period for the following industrial irritants (under threshold concentration given in parentheses): ethanol (2), dioxane (2), methylethylketone (1/2), epichlorohydrin (1/2), acetic anhydride (1/2), acrylonitrile (1/2), ethylene glycol (1), and xylene (1/200). Indications by the method described correlate well with the usual means of determining irritative effects (dioxane is an exception for which this method indicated a higher irritative effect). It is noted that this method is effective at concentrations which cause no visible changes in either the conjunctiva or cornea of the rabbit.

12697

Filov, V. A.

KINETIC MODEL OF THE ACCUMULATION OF CARBONS SUBSTANCES IN THE ORGANISM DURING PERIODIC INHALATION. [O kineticheskoy modeli nakopleniya v organisme uglevodorodnykh veshchestv pri ikh periodicheskom vdykhanii]. Text in Russian. Doklady Akad. Nauk SSSR, 186(6):1458-1460, 1969. 9 refs.

A mathematical model was constructed to determine the concentration of an inhaled gas in tissues of an individual exposed to the gas during his working days. An equation was developed which defined the concentration in tissues at the nth working day in terms of the concentration of the substance in the inhaled air, the time of exposure, the days of exposure, and constants related to the distribution of a particular gas between tissue and air. When the equation was tested against chloroform and ethyl alcohol, for which most of the constants were known, the result corresponded with experimental data. The equation was also successful in predicting tissue concentration of benzene and carbon disulfide in the fatty tissue of rabbits exposed for various periods to these gases.

13860

Feldstein, M.

TOXICITY AND ANALYSIS OF AIR POLLUTANTS. J. Forensic Sci., 10(3):329-351, July 1965. 68 refs.

The emission of solids, liquids, and gases from industrial operations, power and heat generation using fossil fuels, combustion of organic waste materials, and auto exhaust constitute the major sources of air pollution. Carbon monoxide, as a community air pollutant, is emitted to the atmosphere from most combustion operations where incomplete combustion of organic matter occurs. Exposures to 50 ppm for four to six hours may result in blood carboxyhemoglobin concentrations as high as 60 of the total pigment. Nitrogen dioxide is the primary reactant in photochemical smog, and is found to cause acute pulmonary edema. Physiological responses to low concentrations of both SO2 and NO2 in similar and involve bronchial constriction. The response with SO2 is 5 to 20 times greater in experimental animals than with NO2 on an equal concentration basis. It is now believed that there is no tolerable dose of a carcinogen. Skin tumors were produced in animals by as little as 0.4 microgrames of benzpyrene. Part of the reason for increased lung cancer is ascribed to carcinogens present in air pollution. General other pollutants and the various ways of analyzing pollutants are also discussed.

13866

Epstein, Samuel S. and H. Shafner

CHEMICAL MUTAGENS IN THE HUMAN ENVIRONMENT. Nature, 219(5150): 385-387, July 27, 1968. 13 refs.

Preliminary data are presented on the feasibility of mutagenicity testing in mice based on screening a wide variety of environmental pollutants. In the dominant lethal test, treated males were mated with groups of females. The females were subsequently dissected at mid-term of pregnancy to evaluate the incidence of dominant lethal mutations. Such effects conventionally reflect mutagenic activity and represent fetuses killed in utero by mutations directly induced in male germ cells. The possibility of systemic drug effects in females was thus excluded. Test materials were freshly prepared and injected intraperitoneally. A mutagenic index (M.I.), reflecting the incidence of dominant lethal mutations in an experimental group of animals, was calculated. The index does not reflect anti-fertility effects or the distribution of deciduomata in sacrificed animals. It was found that organic extracts of atmospheric particulate pollutants displayed control M.I. levels. The dominant lethal test described appeared to be a practical screening procedure, especially because 80% of gene mutations in man are attributable to dominant autosomal traits. Modification of the test procedures to evaluate the role of chronic low-level exposure to environmental mutagens, either singly or in combination, is in progress.

19951

Lindberg, Walter

AIR POLLUTION IN NORWAY. III. CORRELATIONS BETWEEN AIR POLLUTANT CONCENTRATIONS AND DEATH RATES IN OSLO. (Den alminnelige luftforurensning i Norge. III. Korrelasjoner mellom luftforurensninger og dødelighet i Oslo.) Translated from Norwegian. Oslo: Oslo. (Norway), p. 78-102, 1958. 23 refs.

Extensive data are presented to show the correlation of air pollution in Oslo, Denmark and death rates. The data include causes of death, types of pollutants, SO2 concentration, and meteorological factors. The results indicate a causal connection between mortality and air pollution. More investigations are recommended.

19960

Meyneqa, V. G.

THE SIGNIFICANCE OF THE ADRENALS IN THE EFFECT OF METHANE-OXYGEN HYPOXIC GAS MIXTURES. (O znachenii nadpochechnikov pri vozdeystvii metano-kislorodnoy gipoksicheskoy gazovoy smesi). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, 13(3): 57, 1969.

Groups of white rats were exposed to a hypoxic mixture of gas with a composition approximating that of firedamp after various preliminary treatments. The gas mixture consisted of 87% methane, 9% ethane, trace amounts of propane, butane, nitrogen, krypton, and 6% oxygen. The control group was untreated; the second group consisted of 10 rats which were adrenalectomized; the third group consisted of 9 rats which were laparotomized with the adrenals left intact; the fourth group consisted of 9 rats which received 10 mg/kg hydrocortisone 20 min before being exposed to the firedamp gas; and the fifth group consisted of 11 rats which received 90 units/kg of ACTH 20 min prior to exposure. Behavior of the animals, frequency of respiration, oxygen consumption, and survival time were monitored in all groups. After a few minutes, the animals developed increased motor activity, respiration increased in frequency, and there were other signs of irritability. After 1-2 hrs, the animals were sedated, respiration was still rapid, and death resulted in about 5 hrs. Survival time was half as long in the adrenalectomized rats as in the controls and oxygen consumption was increased. There was a slight increase in resistance to the hypoxic gas in laparotomized animals. Survival time in animals given hydrocortisone was significantly higher--329 plus or minus 27 min versus 237 plus or minus 16 min in the controls. ACTH had no effect on survival.

19119

Neuss, Jon N. and William A. Glasson

HYDROCARBON REACTIVITY AND EYE IRRITATION. Environ. Sci. Technol., 2(12):1109-1116, Dec. 1968. 21 refs.

Twenty-five hydrocarbons and nitric oxide were irradiated in a smog chamber. Eye irritation and various chemical reaction rates and product yields were used to measure hydrocarbon reactivity. Although the chemical measurements of reactivity correlated with one another to a fair degree, there was no correlation between any of the chemical measurements and eye irritation. A correlation was found between hydrocarbon structure and eye irritation; a hydrocarbon reactivity scale based on eye irritation is presented. The most potent precursors of eye irritation were benzylic hydrocarbons and aromatic olefins. A new and extremely potent eye irritant, peroxybenzoyl nitrate, a lachrymator 200 times as potent as formaldehyde, was identified as a product from the irradiation of benzylic hydrocarbons and aromatic olefins. (Author abstract modified)

16422

Shabad, L. M.

BLASTOMOGENIC SUBSTANCES IN THE HUMAN ENVIRONMENT AND SOME MECHANISMS GOVERNING ORIGINATION OF CANCER. (O blastomogennykh veshchestvakh v okruzhayushchey cheloveka srede i nekotorykh mekhanizmakh vozniknoveniya raka). Text in Russian. Vestn. Akad. Med. Nauk SSSR, 24(6):3-13, 1969. 17 refs.

During a study of atmospheric pollution by carcinogenic hydrocarbons, aircraft engines were discovered as a source of contamination. Both carbon black and exhaust gases contained considerable amounts of benzopyrene(BP). The amounts of this substance detected in the ground of airfields decreased with distance away from the runways and landing strips. A study of soil contamination with BP showed it was capable of passing into plants and was liable to destruction by soil bacteria. Weeds and silt found downstream in a river flowing near a big city contained more BP than the upstream portion. Experiments showed it was possible to remove BP from the water. Certain medicinal preparations may be a source of carcinogenic hazards to man. The mechanism of action in carcinogenic substances is in its deposition in the tissues. Tests with transplacental blastomogenesis demonstrated that embryonic tissues display a high sensitivity to various carcinogenic substances and are apt to stimulate the growth of embryonic tissue organ cultures and produce tumors in them. (Author summary modified)

16494

Imamura, S.; K. Moniyama, and H. Matsui

PUBLIC NUISANCE DUE TO ORGANIC SOLVENTS AND PROPANE GAS (LPG). (Yuki yo sai oyobi sekka gas ni yoru kogai no kuhi rei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):69, April 1969.

Because of complaints about offensive odors emanating from a factory producing propane gas and organic solvents on days when wind direction was southeasterly, simultaneous investigations were undertaken to measure mercaptan, butyl acetate, and toluene levels inside and outside the factory and the effect of these

compounds on factory workers and residents of the area. The surveys were carried out on a day when the prevailing wind was southeasterly. Workers and residents were examined for subjective and clinical symptoms, the latter including liver swelling, pharyngeal inflammation, inflammation of the eye and conjuctiva, and the urobilinogen, albumin, sugar, and hippuric acid content of the urine. In the factory, methyl mercaptan levels did not exceed 0.2 ppm and butyl acetate 20 ppm. Outside the factory, toluene did not exceed 0.1 ppm, methyl mercaptan 0.2 ppm, and butyl acetate 5 ppm. At an exit of an organic solvent washer, 100 ppm toluene was found but was attributed to a defect in the washer's design. Comparison of the subjective and clinical symptoms with those of a control group suggests that the rate of positive urobilinogen and abnormal discharge of hippuric acid in urine of people living near the factory is higher. Residents living within 30 m downwind of the factory exhibited an abnormally high discharge of hippuric acid. Workers also showed higher rates of positive urobilinogen and an abnormal discharge of hippuric acid.

14598

Arkhipova, O. G.

MECHANISM OF ACTION OF THE NEW ANTIKNOCK COMPOUND MANGANESE CYCLOPENTADIENYLTRICARBONYL ON THE ORGANISM. English translation of: Gigiena Truda i Prof. Zabolevaniya (Moscow), No. 6:51-56, 1963. 5 refs.

It has been suggested that manganese cyclopentadienyltricarbonyl (MCT) be used as an antiknock compound in internal combustion engines to replace tetraethyl lead. Investigations which give a general description of the changes that occur in the organs and systems of organisms following the administration of MCT are reported. The compound was administered by inhalation to rabbits and white rats. Results showed that the MCT is a toxic substance of polytropic action; MCT vapor disturbs the function of the nervous system and kidneys, and reduces the osmotic resistance of the erythrocytes. It affects the normal course of the oxidation process and the processes of oxidative phosphorylation. Oxygen inhalation has favorable effect in acute MCT intoxication.

14711

Dontenwill, W.; H. Eisenhorst, G. Hecksch, H. P. Harke, and L. Stadler

STUDIES ON THE REMOVAL AND CATABOLISM OF CANCEROGENIC HYDROCARBONS IN THE RESPIRATORY TRACT OF GOLDEN HAMSTERS EXPOSED TO SMOKE. (Experimentelle Untersuchungen ueber die Beeinflussung von Abbau und Abtransport cancerogener Kohlenwasserstoffe im Bereich des Respirationstraktes durch passive Beraucbung von Goldhamstern). Text in German. Z. Krebsforsch., 72(1):63-84, 1969. 2 refs.

Three groups of male golden Syrian hamsters were studied: (1) hamsters not exposed to smoke which received a single intratracheal injection of 500 micrograms of 3,4-benzopyrene in carboxymethylcellulose; (2) hamsters exposed three times

a day, 5 days a week, for 10 mis to cigarette smoke (equivalent to 30 cigarettes each time), and receiving an intratracheal injection of benzopyrene after four weeks of exposure; and (3) hamsters exposed for four weeks to cigarette smoke prior to and following administration of benzopyrene until killed. The times from administration of benzopyrene to killing of the animals were 3 min, 4 hrs, and 7, 5, 8, and 12 to 20 days. The results show that there is no clear difference in the removal from the lungs and metabolism of 3,4-benzopyrene in smoke-exposed and non-exposed animals.

19726

Dontenwill, W., H. Eisenhorst, G. Bochsch, H. P. Harke, and L. Stadler

EXPERIMENTAL INVESTIGATIONS ABOUT THE INTAKE, TRANSPORT, AND METABOLISM OF CANCEROGENIC HYDROCARBONS IN THE RESPIRATORY TRACT. (Experimentelle Untersuchungen ueber Aufnahme, Abtransport und Abbau cancerogener Kohlenwasserstoffe im Bereich des Respirationstraktes). Text in German. Verhandl. Deut. Ges. Pathol. (Stuttgart), vol. 52:401-408, April 1968. 3 refs.

While the various methods of subcutaneous and cutaneous testing of carcinogens are standardized, the intravenous methods are not. Therefore, studies were conducted to standardize the experimental technique and to gain information on the relationship of dose and effect, absorption and metabolism of various carcinogens in the lung. Benzopyrene (BP) and must were administered to hamsters as suspensions (150 mg DMBA + 150 mg Fe2O3 + 10 ml NaCl solution; 150 mg BP + 150 mg Fe2O3 + 10 ml NaCl solution; and 15 BP + 15 carboxymethylcellulose (CMC) + 9ml NaCl solution) and solutions (BP and DMBA in polyethylene oxide and BP in sesame oil). The Saffiotti method was used. Column chromatography and fluorimetry were used for determination of the carcinogenic substances in the organs and the blood. The effects of the carcinogens on the lung depended to a large extent on the type of solution and residence time. Dissolved carcinogens remained in the lungs just for a short time so that the carcinogenic effect was diminished. Suspended carcinogens were slowly dissolved in the lung and very slowly absorbed. Thus, their long residence time enhances the carcinogenic effect. Only the benzopyrene-CMC suspension was reproducible; the hematite-benzopyrene suspension fluctuated widely so that only about 50% of the theoretical amount reached the lung.

15349

Hayata, Yoshihiro, Kenkichiche, and Yuji Saito

AIR POLLUTION AND LUNG CANCER. (Haiki osen to haigan). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(9):9-15, Sept. 1969. 16 refs.

The relationship of lung cancer to cigarette smoking was investigated among workers in an industrial city with special emphasis on the types of cancer peculiar to some occupations. Among the total number of subjects with lung cancer (8000), 88.2% of the males and 21.1% of the females were cigarette smokers. The relationship of cancer types to smoking habits was the following: 28.6% of the non-smokers, 44.2% of the light smokers, and 47.8% of the heavy smokers had squamous carcinoma; 49.8% of the non-smokers, 32.2% of the light smokers, and 25.6% of the heavy smokers had adenocarcinomas; and 21.6% of the non-smokers, 23.6% of the light smokers, and 26.6% of the heavy smokers had anorphous-type carcinoma. Squamous carcinoma originates in the basal cells of the bronchial mucosa due to specific irritations. A cigarette smoker's bronchial mucosa, when cancerous, typically contains a mixture of partly metamorphosing, partly destroyed and dangerating cells, and anorphous cells, and presents a means of identifying cancer due to smoking. The highest death rates from cancer were found in the most industrialized cities, such as Tokyo, Fukuoka, and Yokohama. 3,4-Benzopyrene is considered a carcinogen; in Okunoshima, where mustard gas has been produced for 19 years, a tremendous number of bronchial cancer cases was found. Another study of the mining industry showed a relationship between organic dusts and pneumonia and lung cancer.

19490

Holland, George J., David Benson, Albert Bush, George Q. Rich, and Robert P. Holland

AIR POLLUTION SIMULATION AND HUMAN PERFORMANCE. Am. J. Public Health, 58(9):1688-1691, Sept. 1968. 35 refs.

The effect of short-term exposure to moderate levels of photochemical air pollutant constituencies on the efficiency of various types of human motor performance was determined. Reaction time, vital capacity, and submaximum work performance on the bicycle ergometer were measured in 16 college student volunteer subjects. The subjects were randomly assigned to one of two groups according to the Latin square method of experimental design. They served alternately on two occasions as either control subjects in a normal atmospheric environment or as experimental subjects in an air pollution environment. In order to simulate the conditions of the Los Angeles Basin, a test facility was designed. Irradiated exhaust gases from an automobile were pumped into an exercise booth near the reaction tunnel. A ventilation system was used to replace the exhaust gases with filtered atmospheric air during the control experiments. Air samples were analyzed for carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, oxidants, hydrocarbons, aldehydes, and formaldehyde. It did not appear from the study that the performance of fine neuromuscular tasks such as reaction time or cardiorespiratory work efficiency were significantly altered by short-term exposure to moderate levels of air pollution. More study is required to elucidate the effects of air contaminants on other types of human psychomotor performance, especially maximum work capacity. Many atmospheric pollutants may have an insidious qualitative biochemical effect on human physiological processes which can only be identified through careful longitudinal study. Future studies involving higher levels of contamination with more precise measures of airway resistance are recommended.

10219

Schliphoster, H. E.

DANGERS OF THE METROPOLITAN CITY AIR. (Gefahren der Grossstadtluft). Text in German. Gesundheitswesens (Stuttgart), 29(3):117-126, March 1967. 37 refs.

Differentiation between the amount of fine dust and coarse dust makes it feasible to obtain information on possible health perils, since it is known that primarily the fine dust penetrates into the human body, while the coarse dust deposits on buildings and objects. The dust concentration fluctuates with the wind conditions; it varies with the seasons and over the course of a week. The fine dust shows a maximum at the beginning of the week; the coarse dust, in the middle of the week. It is much more difficult to assess objectively the harms of odors. Test persons have to render their subjective opinion on the intensity of odors. In order to determine the effect of gases, dusts, and liquid aerosols on humans, the physical disposition and age must be taken into consideration. Several tests were conducted to get an estimate of the amount of benzopyrene retained by a human during his lifetime. It was found that only a maximum of 0.06 microgram of benzo(a)pyrene (BP) was retained by the lungs. To test how fast the benzopyrene content is dissolved, white rats received 20 mg of soot containing 12 micrograms BP/g dust. In the first three days, 80% of the BP content separated from the soot while 20% remained adsorbed on the soot for more than 20 days. Tests also showed that sudden high air pollution concentrations (at temperature inversions) speeded the death of humans. The increase of the mortality rate of such conditions but no higher mortality over a longer period of time (e.g., 2 years) leads to this assumption.

10252

Munson, Edwin S., W. Reynolds Bates, and Donald Caton

EFFECTS OF HALOTHANE, CYCLOPROPANE AND NITROUS OXIDE ON ISOLATED HUMAN UTERINE MUSCLE. J. Obstet. Gynaecol. Brit. Commonwealth, 76(1):27-33, Jan. 1969. 19 refs.

The spontaneous contractility of isolated human non-gravid uterine muscle strips was studied during exposure to various concentrations of halothane, cyclopropane, and nitrous oxide. Mean contractility values for 10 per cent cyclopropane and 50 per cent nitrous oxide were not significantly different from control values. Halothane in 0.37 per cent concentration produced a significant reduction in contractility. Further reduction in contractility was proportional to the halothane concentration. It is predicted that inhibition of contractility would occur at a halothane concentration (partial pressure) of 1.2 per cent. At an equivalent anaesthetic concentration of cyclopropane (15 per cent) contractility was 57 per cent of the control value. The results showed no significant reduction in the resting tension of non-gravid muscle strips during exposure to halothane in concentrations capable of effecting marked reductions in contractility. It was concluded that at equivalent anaesthetic concentrations, halothane is a more potent depressant of non-

gravid uterine muscle than nitrous oxide or cyclopropane. Of the agents studied, cyclopropane was the least depressant. (Author summary modified)

16365

Bierstecker, H.

POLLUTED AIR, ORIGIN, MEDICAL SIGNIFICANCE AND COMPARISON OF POLLUTED OUTSIDE AIR. (Verontreinigde lucht, oorzaken, medische betekenis en beoordeling van verontreinigde buitenlucht). Assen, Van Gorcum, 1966, 216p., 339 refs. Translated from Dutch. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 275p., July 29, 1969.

Factors affecting emissions are considered, together with trends in emissions in the Netherlands and Rotterdam. The qualitative and quantitative significance of air pollutants as potential disease agents in Rotterdam is evaluated. The maximum sulfur dioxide concentration so far recorded in Rotterdam is 1600 micron gu m; the maximum smoke concentration, 990 micron/cu m. No epidemiological significance is attributed to measured concentrations of fluorides, nitrogen dioxide, carbon monoxide, or lead. Concern is shown for the role of benzpyrene and other carcinogens in the etiology of lung cancer. Distinctions are made between acute, sub-acute, and chronic air pollution. During acute air pollution, SO2 and smoke concentrations in Rotterdam show five-fold increases. Sub-acute pollution occurs when wind speeds drop below 3 m/sec. Chronic air pollution is present on all other days, especially in winter. Though the effects of pollution can also be categorized as chronic, acute, and sub-acute, the level of air pollution is still too weak to cause illness. Methodologies employed in determining the relationship between air pollution and human mortality and morbidity are reviewed, and hypotheses developed to describe the effects of pollution on illness and death in Rotterdam. Refinements in analytical methods are urged so that the factors influencing increased chronic non-specific lung disease mortality and lung cancer mortality can be identified. It is also suggested that emission standards be supplemented by regulations making it possible to restrict emissions when meteorological data and monitoring station readings point to certain dangers.

16366

Lichtenstein, E. P., K. R. Schulz, T. W. Fuhremann, and T. T. Liang

BIOLOGICAL INTERACTION BETWEEN PLASTICIZERS AND INSECTICIDES. J. Econ. Entomol., 62(4):761-765, Aug. 1969. 10 refs.

The toxicity of polychlorinated bi- or triphenyl plasticizers, both singly and in combination with dieldrin or DDT, was investigated in tests on Drosophila melanogaster Meigen and house flies. Many of the more volatile plasticizers were toxic to both test insects, but to a lesser extent than dieldrin or DDT. As measured by the percent mortality of the insects over a 24- or 48-hr exposure period, dieldrin was the most toxic compound. Approximately 25 and 30 times more DDT and 6000 and 1000 times more plasticizers were required to obtain mortalities

comparable to those achieved with dieldrin. The toxicity of the plasticizers increased with a decrease in their chlorine content. The more highly chlorinated and less volatile plasticizers were nontoxic, even when used at dosages of 2000 micrograms with D. melanogaster and 20 micrograms/ house fly. Though no appreciable insect mortalities were observed with plasticizers alone, they significantly increased to toxic effects of both dieldrin and DDT. While no conclusions can be drawn concerning the combined effects of plasticizers and insecticides in tissues of higher animals, the potential hazards of plasticizers, especially in combination with other synthetic chemicals, should not be disregarded.

16582

Sasuta, Hasao, Noburu Ishiniahi, Yasushi Kodama, and Hisaburo Kunitake

EFFECTS OF HARMFUL POLLUTANTS ON HUMAN HEALTH. (Tugai gasu ni yoru taiki osen no jinkai ni oyobosu eikyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):665-690, Aug. 15, 1966. 12 refs.

In London, the average daily death rate has increased 1.3- to 3.6-fold on days of dense smogs. For instance, the death rate during the smog episode of 1952 was 3.8 times higher than average. About 4000 persons, mostly over 60, who had chronic respiratory difficulties were affected by the smog. The symptoms they exhibited were severe cough, throat pain, labored respiration, hoarse voice, fever, headache, and vomiting. The death rate due to air pollution in London or other northern European countries is of particular interest because heavy smoggy days are frequently characterized by the absence of wind. This has not been the case in Japan. A comparative medical survey of industrial and rural areas showed a higher incidence of respiratory organ disease and lung cancer than in industrial areas. Though suggesting that lung cancer has a close relationship with air pollution, the finding should be reconfirmed in connection with cigarette smoking, since 3,4-benzpyrene, supposedly responsible for causing lung cancer, is contained in both smoke dust and cigarette smoke.

8. EFFECTS -- PLANTS AND LIVESTOCK

00009

G. C. Taylor

"OXIDANT" AIR POLLUTANTS AS PHYTOTOXICANTS. California Univ., Riverside. Air Pollution Research Center. (Paper 68-91). 1968. 13 pp.

This report attempts to outline some of the advances made in the identification and study of oxidizing toxicants other than ozone in the "smog" complex and to indicate some of the avenues of research that are prerequisites to the establishment of effective control measures. Assuming that the total elimination from the atmosphere of oxidant-forming pollutants is not economically feasible, it is essential that investigations be continued to determine acceptable levels of the pollutants, to find resistant plant materials and to search for chemical additives that might offer protection to the vegetation.##

00184

H. H. Heggestad, F. H. Bucheson, J. T. Middleton, and H. F. Darley

Six tobacco varieties representing a range in susceptibility to naturally occurring ozone flech in field plots at Beltsville, Maryland, were: (1) fumigated with ozone, (2) fumigated with ozonated hexene-1, and (3) exposed to ambient air at Riverside, California. Prior to fumigation, all plants were grown in a greenhouse with carbon-filtered air. Injury caused by ozone to tobacco in fumigation studies could not be distinguished from naturally occurring flech in fields at Beltsville. The susceptibility of the six varieties to ozone flech was very similar at Riverside and Beltsville. When fumigated with ozonated hexene-1, however, the injury occurred only on lower leaf surfaces and the reactions of varieties were very different. Some injury to the lower leaf surface of young leaves, perhaps caused by peroxyacetyl nitrate (PAN) was noted when plants were exposed to unfiltered ambient air in a Riverside greenhouse. No injury occurred to any of the varieties of N. tabacum grown in the greenhouse with carbon-filtered air. The sequence of damage by ozone and ozonated hexene-1 was from oldest to youngest leaves. Ozone caused more damage to leaves at the bottom of the plant, whereas ozonated hexene-1 injury was more severe about mid-plant. Although ozone injury occurred on tobacco exposed to ambient air at Riverside and Beltsville, some differences in leaf damage and plant sensitivity at these two widely separated geographic locations are discussed. (Author)##

00239

J.F. Biddleton A.J. Reagen-Smit

THE OCCURRENCE, DISTRIBUTION, AND SIGNIFICANCE OF PHOTOCHEMICAL AIR POLLUTION IN THE UNITED STATES, CANADA, AND MEXICO. J. Air Pollution Control Assoc., 11(3):129-136, Mar. 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The cracking of rubber, production of elevated oxidant and the occurrence of both ozone and oxidant plant damage are shown to be manifestations of photochemical air pollution. Geographic areas considered are Los Angeles, San Francisco, Washington, D.C.; urban and non-urban areas.##

00235

F.W. Oliver

ON THE EFFECTS OF URBAN FOG UPON CULTIVATED PLANTS. J. Roy. Hort. Soc. 16, 1-59, 1893. (The second Report presented to the Scientific Committee of the Royal Horticultural Society, Feb. 16, 1893.)

Author discusses the effect of foreign material emissions associated with fog as they might cause damage to plants. The categories covered by author are: Remedial Measures to be Taken; Behavior of Different Classes of Plants (i.e. Ferns, Monocotyledons, Dicotyledons); Effect of Reduced Illumination; Changes which the Chlorophyll Undergoes in Leaves Injured by Fog; Behavior of Flowers toward Fog and Certain of Its Ingredients; Action of Pyridine and of Allied Bodies; and Action of Pyridine and of Allied Bodies; and Action of Acid and Other Vapors.##

00216

A. R. Gregory

EFFECTS OF AIR POLLUTION ON EDIBLE CROPS. North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering. May 1969. pp. 21-3.

The effects of air pollution on edible crops should be differentiated at the onset from the effects of air pollution on vegetation in general. For example, sulfur dioxide has a very pronounced effect on pine needles, but pine needles are a minor food source. It has been variously estimated by different authorities that the annual loss of vegetable produce amounts to 40 to 60 million dollars. Although this over-all type of damage is very real to the vegetable producer and is of great economic interest, it is of less concern

to those in public health. Their concern is with the damage that alters the content o of crops but does not alter the appearance sufficiently to prohibit their sale. This results in threats to public health through the insidious route of the gastro-intestinal tract. The alterations in edible crops that are usually not apparent to the consumer fall into two categories: (1) loss of nutrients such as vitamins, proteins, essential fatty acids, etc. and (2) the addition of some substance to the food which is toxic when absorbed from the gastro-intestinal tract. The loss of nutrients has been established in many cases. Some of the substances which have been shown to produce nutrient damage to produce are: ozone, nitrosamines, peroxyacyl nitrates, nitrogen oxides, and ethylene. Of probably greater importance to health now and assuredly in the future is the addition of some toxic substance to the produce. With the advent of possible atomic power plants, Be was studied for toxicity and found to be extremely toxic. It was found that Be taken up into bush beans was not only toxic itself, but decreased the Cu content. In this way it fell into the category of primary toxicant and also into the category of nutrient depletor. Many other compounds also fall into both categories. With the many new insecticides, herbicides and larvicides being manufactured, it has become imperative to be aware of the problem of both the effect on edibles of a toxicant and also its effect on the plant, that is, loss of minerals, vitamins, etc.##

00691

H. Kotaka, A.P. Krueger P.C. Andriese

EFFECT OF AIR IONS ON IAA CONTENT OF BARLEY SEEDLINGS. Plant Cell Physiol. (Tokyo) Vol. 6:711-9, 1965.

Exposure of barley seedlings (Hordeum vulgare) growing in sand and liquid cultures to either negatively- or positively-ionized air results in increased growth in terms of integral elongation, and fresh and dry weight increase. Using large quantities of tissue and a modified method it was found that free and bound IAA contents were not significantly modified by exposure of seedlings to ionized air. It might be supposed that an equilibrium between free and bound IAA was not modified by exposure to air ions. (Author abstract)##

00696

A. F. H. Cole and R. Bate

SUMMER OZONE CONCENTRATIONS IN SOUTHERN ONTARIO IN RELATION TO PHOTOCHEMICAL ASPECTS AND VEGETATION DAMAGE. J. Air Pollution Control Assoc. Vol. 16(5):201-206, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-113.)

This paper describes an air pollution investigations at Port Burwell, Ontario to determine the pollutant responsible for flack damage. The study was part of a cooperative project with groups representing the Canada Department of Agriculture, the Meteorological Branch of the Canada Department of Transport, the Air Pollution Control Branch of the Ontario Department of Health, and Imperial Tobacco Co. of Canada Ltd. In 1960 and 1961 the air pollution phase of the project was undertaken by the Occupational Health Division of the Department of National Health and Welfare.##

00737

J.T. Middleton, L.G. Kats, G.C. Taylor

AIR QUALITY CRITERIA AND STANDARDS FOR AGRICULTURE. J. Air Pollution Control Assoc., 18(10):676-680, Oct. 1968. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-25, 1965)

Air pollution damage to crops is not only important for the damage it causes agriculture but because vegetation damage is a harbinger of air pollution problems affecting man and his well-being. Some of the effects of varying dosages of ethylene, fluorides, ozone, PAN, and sulfur oxides on plants and animals are given. Knowledge of the response of certain plants and animals to specific air pollutants permits the establishment of air quality standards for certain of these pollutants. The importance of environmental conditions on host responses to these several toxicants is also presented to illustrate the need of stipulating environmental conditions as well as toxicant dosages when establishing air quality criteria and standards for the protection of the agricultural resource.##

00950

W. A. Duyger, jr.; J. Roubal, and B. L. Palser

PHYSIOLOGICAL AND BIOCHEMICAL EFFECTS OF ATMOSPHERIC OXIDANTS ON PLANTS. J. Air Pollution Control Assoc., 16(9):467-471, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-47.)

Photochemically produced oxidants in the atmosphere cause injury to plants primarily through inhibition of basic metabolic processes. Plants vary in their response to the oxidants and this variation must be dependent in part on the variation in metabolic activity with age or environmental conditions for growth, to a large degree not understood. Data are presented in this paper to show: (1) The changes in permeability of leaf tissue to exogenous substrate and in catabolic utilization of this substrate after exposure of plants to ozone but before visible symptoms appear; (2) The change in leaf carbohydrates as a result of exposure to ozone; (3) The protective effect of red light (700 millimicrons) during exposure of bean plants to peroxyacetyl

nitrate (PAN); (B) The correlation of sulfhydryl (SH) content in bean leaf tissue with age of plants and light regime; and (C) Effect of light regime and age of plants on incorporation of C14 from C14-Pan by bean leaf tissue. (Author abstract)##

00961

I. J. Hindawi and A. P. Altshuller

PLANT DAMAGE CAUSED BY IRRADIATION OF ALDEHYDES. Science 146(3644):538-542, Oct. 23, 1964.

The report that damage to petunia has been correlated with the presence of aldehydes in the atmosphere is discussed in relation to recent laboratory findings. Laboratory investigations have shown that irradiation of formaldehyde in air will not cause plant damage to the varieties of petunia, pinto bean, and tobacco wrapper used, even when nitrogen oxide is added to the system. Irradiation of propionaldehyde in air does cause damage to these plants. Addition of nitrogen oxide to the irradiated propionaldehyde-in-air system does not markedly increase damage. (Author abstract)##

01179

F. B. Abeles

THE EFFECT OF ETHYLENE ON AUXIN TRANSPORT (TECHNICAL MANUSCRIPT 279). Army Biological Labs., Frederick, Md.; Directorate of Biological Research. Jan. 1966. 12 pp.
DDC: AD 476769

Ethylene was found to have no effect on auxin transport in hypocotyls, coleoptiles, or leaf petioles. (Author abstract)##

01809

J.T. Middleton

TRENDS IN AIR POLLUTION DAMAGE. Arch. Environ. Health 8, 19-21, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Plant damage from particulates, oxidants, ozone, ethylene, fluoride and sulfur dioxide are discussed. The trends in California are emphasized. The relevant literature is reviewed.##

02299

J.T. Middleton

PLANT DAMAGE: AN INDICATOR OF THE PRESENCE AND DISTRIBUTION OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 34, (3) 477-80, 1966.

Air pollutants may damage plants and cause death or destruction of tissue with visible pathological symptoms, reduce growth, productivity, and commodity quality, and interfere with biological processes without causing visible injury symptoms. The contaminants responsible for damage may be either particulate or gaseous in nature. The solid particles released into the atmosphere are sometimes the cause of soiling of fruits and vegetables, tissue damage to exposed leaves and fruits, growth reduction; in addition, they add a toxic burden to forage crops used as feedstuffs for livestock. Liquid particles, such as acid aerosols and toxic mists, are sometimes responsible for leaf spotting. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants, which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements. This discussion of plant damage symptoms and responses has been directed to the qualitative aspects necessary for assessing the presence and distribution of pollution. As to the evaluation of the concentration and duration of exposure to specific pollutants, experimental systems are available, or can be designed, to meet these specific quantitative needs once the presence of given pollutants has been determined.##

02597

O. Heidman

EFFECTS OF AIR POLLUTION ON PLANTS. African Violet Mag. 18, (3) 44-7, Mar. 1965

The first indication of an air pollution problem is often the injury that appears on comparatively sensitive vegetation. Some plants are more resistant than others to a given phytotoxicant. Plant injury from air pollution is caused primarily by the major gaseous pollutants (sulfur dioxide, fluoride gases, ethylene, and the components of the photochemical smog complex) and is produced in various ways in urban or industrial areas. These major pollutants and several of the minor pollutants are discussed in this paper.##

04116

G. Tondron

EFFECTS OF AIR POLLUTION ON ANIMALS AND PLANTS. European Conf. on Air Pollution, Strasbourg, 1960. pp. 25-69.

There is no doubt as to the effects of air pollution on plants and animals, particularly in the case of a few specific and very dangerous pollutants which are emitted in considerable quantities. In certain regions of Europe, life depends on immediate steps being taken to protect flora and fauna. There is no doubt that they will need to be mainly of a technical nature. It is a matter of reducing the discharge of polluted waste and attenuating, if not completely eliminating, the dangers involved. The necessary technical research must be organized in such a way as to cover all the different aspects of animal and plant life, the safety of which is indissolubly bound up with that of human life. In the Netherlands, a team of workers succeeded in arresting the devastation of horticultural crops by fluorine emissions thanks to the use, during the period of growth, of a raw material which when processed did not give off toxic fumes. In France, the Association for the Prevention of Air Pollution has set up a study group known as the "Committee for studying the effects of air pollution on cultivated plants and animals" to standardise working methods throughout the country. Mention should also be made of the Norwegian and British studies of the preventive effects of various fluorine alleviators and the research being done in the Federal Republic of Germany on the stimulation of plant nutrition by industrial emissions, as well as on countering the effects of such emissions by the addition of fertilisers. These few achievements show the importance of rational organisation and cooperation in research.$$

01292

P. R. Gustafson, H. H. Stephens, and H. A. Cardiff.

THE PRODUCTION OF PURE PEROXYACYL NITRATES. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Some naturally occurring photochemical products of "smog" were first identified as "compound X" by Stephens et al in 1956. In 1960, the first member of the series was recognized as peroxyacetyl nitrate (PAN) by Stephens et al. The C3 homologue, peroxypropionyl nitrate (PPN) was reported in synthetic mixtures by Stephens in 1961. Both the C2 and C3 homologues were detected in ambient air by Darley et al in 1963, only from synthetic preparations. The first 3 organic X compounds have been synthesized and purified at the Air Pollution Research Center, University of California, Riverside, for the past several years. Plant fumigations have demonstrated that these compounds are capable of inducing injury symptoms indistinguishable from those caused by photochemical smog. They are also powerful eye irritants. They have been identified (as a class) in artificially irradiated dilute auto exhaust, and in artificially irradiated mixtures of realistic concentrations of pure hydrocarbon plus oxides of nitrogen. The three purified synthetics have been used in plant fumigation tudies, in eye irritation studies, in physical and chemical studies designed to confirm the structure of the compounds, and in instrument design and calibration. The principal problem in this preparation is the extreme instability of these compounds.$$

03395

A.G. Thomas

EFFECTS OF AIR POLLUTION ON PLANTS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 233-78.

The literature on the effects of air pollution on plants has been reviewed with special reference to those pollutants that present major problems - viz., SO_2, HF, London type smog, and Los Angeles type smog. The others, which are definitely of minor importance, are referred to more briefly. SO_2 has long been recognized as an air pollutant because it arises from the combustion of nearly all fuels, especially coal, and from the roasting of sulfide ores. It is phytotoxic in concentrations above 0.1 to 0.2 p.p.m., depending on the length of exposure. Below about 0.5 p.p.m., the gas tends to be oxidized in the cells as rapidly as it is absorbed, and interference with functions such as photosynthesis is slight. Toxic concentrations of sulfate are finally accumulated. Chronic rather than acute injury, if any, is generally manifested with these small concentrations. Above about 0.5 p.p.m., acute injury occurs more frequently, owing to the reducing properties of sulfate in the cells. Temporary interference with photosynthesis or "invisible injury" can occur to some extent, but these concentrations cause acute injury if maintained for more than short periods, and recovery is rapid when the fumigation is stopped. HF behaves somewhat similarly to SO_2, except that with a few species of plants it is effective in causing lesions and interfering with photosynthesis in concentrations 2 or 3 orders of magnitude smaller than in the case of SO_2. With most species it is up to 10 times as effective as SO_2. Fluoride accumulated in the cells in sublethal amounts interferes with photosynthesis as does sulfite, but whereas the latter is deactivated by simple oxidation to sulfate, the former must be removed by translocation, volatilization, or some obscure chemical reaction, which makes much slower the recovery of the plant functions after HF fumigation. There appears to be a concentration of HF for each species below which "invisible injury" does not occur. The Los Angeles type smog is fairly well understood as to its mode of formation and its phytotoxic effects, but the actual compounds that cause these effects are still unknown. The smog causes characteristic leaf lesions which are quite different from those produced by other pollutants, including ozone, which may be a constituent of the smog. It also causes some "invisible" injury. Visible damage to crops in Southern and Northern California was estimated at over $5 000 000 and $1 100 000 respectively, annually, in 1956. (Author summary modified)##

04474

E. S. Brandt

AIR POLLUTION EFFECTS ON VEGETATION. Conn. Agr. 27, (8) 494-5, Aug. 1963.

The effects of air pollution particularly of sulfur dioxide, fluorides and photochemical smog on plants are briefly reviewed. The characteristic symptoms of air pollution injury to plants can be useful tool in field surveys. Great care must be exercised in using plants as indicators of air pollution, because many factors affect the symptoms, development, and interpretation of plant indicators.##

03573

W. H. Arnold.

THE LONGEVITY OF THE PHYTOTOXICANT PRODUCED FROM GASEOUS OZONE-OLEFIN REACTIONS. Intern. J. Air Water Pollution 2, 167-74, 1959.

Gaseous mixtures of an olefin and ozone were blown at constant rate through a 32 ft. tube of uniform cross section. A small aquatic plant was placed at prescribed intervals within the tube. The phytotoxicants produced from the ozonization of both 3-heptene and 2-pentene were shown to be unstable. The distribution of plant damage within the exposure tube indicated the longevity of the phytotoxicant. The reduction in chlorophyll content of fumigated plants was used as a quantitative measure of damage. The results suggest that the decay of the phytotoxicant follows a first order or pseudo-first order reaction. The half-life of the phytotoxicant from ozonated 3-heptene is 1/4 hr while the phytotoxicant from ozonated 2-pentene has a much shorter half-life. This difference in stability can be explained in terms of the "zwitterion" mechanism. (Author abstract)##

03595

E. F. Darley, E. R. Stephens, J. T. Middleton, and P. L. Hanst

OXIDANT PLANT DAMAGE FROM OZONE-OLEFIN REACTIONS. Intern. J. Air Water Pollution 1, 155-62, 1959 and Proc. Am. Petrol. Inst., Sect. III 38, 111-22, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif. May 15, 1958.)

The reaction of ozone with five-, six-, and seven-carbon olefins is quite rapid even in the gas phase at concentrations of a few p.p.m. These reaction mixtures produce a toxic material which causes damage symptoms on pinto bean plants which are indistinguishable from those attributed to oxidant-type air pollution. Ozonides, formed in small yield by this reaction, are stable materials which do not damage pinto beans in any way even at concentrations higher than those arising in ozone-olefin reaction mixtures or in outdoor air. Evidence was obtained that the toxic material is unstable even at low concentrations in air. Its half-life appears to be no more than a few min. This result suggests that either a transitory ozone-olefin complex or an

unstable switter ion formed by its decomposition is the actual toxic substance. Attempts to confirm this by adding excess aldehyde or sulfur dioxide to scavenge the toxicant were not successful. (Author abstract)##

03596

E. F. Darley, W. H. Dugger, J. B. Mudd, L. Ordin, O. C. Taylor, and E. H. Stephens

PLANT DAMAGE BY POLLUTION DERIVED FROM AUTOMOBILES. Arch. Environ. Health 6, 761-70, June 1963. (Presented at the Fifth Session, Air Pollution Research Conference on "Effects of Motor Vehicle Emissions on Visibility and Vegetation," Los Angeles, Calif., Dec. 6, 1961.)

Emissions from motor vehicles are now known to be the principal source of the raw materials contributing to photochemical air pollution in California. Some of the products of the reaction, ozone, peroxyacyl nitrates, and the unidentified products of ozone-olefin reactions, are very damaging to the leaves of a variety of crop plants. The injury that was once confined to Los Angeles County now occurs in many states and causes economic loss estimated in excess of $25,000,000 annually. Ethylene, one of the compounds found in the exhaust, is also very injurious to several crops. The ability of a given toxicant to incite injury is dependent on the age of the leaf and the conditions of illumination under which the plant is grown prior to, during, and after fumigation. In addition, the growth of plants, even in the absence of visible injury, is materially affected. Evidence is presented to indicate that the chemical and physical systems within the plant are disrupted by the phytotoxicants. (Author summary)##

03609

J. T. Middleton, J. B. Kendrick, Jr., E. F. Darley

AIR-BORNE OXIDANTS AS PLANT-DAMAGING AGENTS. Proc. Nat. Air Pollution Sym., 3rd, Pasadena, Calif., 1955. pp. 191-8.

The relative susceptibility of some plants to oxidants and determination of the plant-damaging effects of hydrocarbon, ozone, and ozonated olefins are compared. The response of plants beans to air-borne oxidants occurring in the Los Angeles area are described. The survey data were subjected to further analysis by comparing the percent of plants damaged at five stations with the oxidant mean and maximum ranges observed. Data is presented and show that the mean percent of plants damaged increased with increasing oxidant maximum. Author states that the experiment described is the first of its kind designed to determine the relationship between plant damage and oxidant level in the naturally polluted Los Angeles Basin. The results of the study show that the frequency of damage to plants is associated with the oxidant concentrations for both oxidant maximum and daily oxidant mean.##

01609

J. T. Middleton, J. B. Kendrick, Jr., H. F. Darley

AIR POLLUTION DAMAGE TO AGRICULTURAL CROPS. Lasca Leaves 5(1):6-11, Jan. 1955.

Significant damage of celery, spinach and lettuce was noted in 1945 in the vicinity of Los Angeles. Since these symptoms were different from damage usually associated with recognized pollutants, such as sulfur dioxide, fluoride, chlorine and ammonia, investigations were made which revealed that the toxicants causing this silvering and slight glazing followed sometimes by a bronzed discoloration, are oxidized hydrocarbons. This phenomenon occurred only during periods of reduced visibility due to inversions. Research being conducted at the University of Riverside was concerned with how agricultural crops can be grown in an area receiving polluted air masses, and to investigate chemical behavior of pollutants using plants as assay method. These laboratory investigations revealed that concentrations of oxidized hydrocarbons as low as 0.1 ppm cause plant damage. These observations corroborated those made in the field showing that damage to crop is directly proportioned to the length of the pollution period. Methods for protection of plants are being studied and briefly discussed in this paper..##

01610

J. T. Middleton, J. B. Kendrick, Jr., H. F. Darley

AIR POLLUTION INJURY TO CROPS. Calif., Agr., 7(11):11-12, 1953.

Economic losses from air pollution injury on plants in Los Angeles County alone exceeded $500,000 since 1949 when losses were estimated to be $479,495. The components identified causing this damage were certain olefinic peroxides, found when ozone reacts with the vapors of unsaturated hydrocarbons derived from gasoline and other petroleum products. Research is in progress to develop methods for the economic production of agricultural crops in areas affected by air pollution.##

01611

J. T. Middleton

CLEAN AIR FOR GOOD CITRUS. Western Citrus Grower 1(6):6-9, June 1958. (Found in Western Fruit Grower 12, (6), June 1958.)

The adverse effects of polluted air on citrus crops are reviewed. Included in the discussion are the effects of sulfur dioxide, ozone, oxidants and fluorides. It is concluded that abatement measures must be taken to protect agricultural areas.##

03612

J. T. Middleton, E. F. Darley, R. F. Brewer

DAMAGE TO VEGETATION FROM POLLUTED ATMOSPHERES. J. Air Pollution Control Assoc. 8, 9-15, May 1958. (Presented at the 22nd Midyear Meeting, American Petroleum Inst. Division of Refining, Philadelphia, Pa., May 14, 1957.)

Damage to vegetation from polluted atmospheres has been recognized for more than a century. Early interest in air pollution centered largely on smoke and fumes from industrial wastes, particularly those of chemical manufacture, smelting, ceramic production, and coal and petroleum combustion effluents. Vegetation damage has increased with industrialization and urban development. Whereas the principal plant toxicants recognized several decades ago were sulfur dioxide and fluorine, in the last decade a new group of airborne phytotoxicants has been described and identified as oxidants. The principal source of these oxidants is believed to be photolysis reaction products of auto exhaust. Atmospheric contaminants responsible for damage to vegetation may be described as particulates - such as dusts and acid aerosols - and gases - such as sulfur dioxide, halogens, oxidized organics, ozone, nitrogen dioxide, hydrogen sulfide, ammonia, and carbon monoxide. Of these diverse pollutants, gases generally cause more damage to plants than do particulates.##

03613

J. T. Middleton A. G. Paulus

THE IDENTIFICATION AND DISTRIBUTION OF AIR POLLUTANTS THROUGH PLANT RESPONSE. A.M.A. Arch. Ind. Health 18, 528-32, Dec. 1958. (Taken from a paper presented at the 17th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., Apr. 23-27, 1956.)

This paper presents an annual summary of monthly tabulations showing plant damage occurring in 17 of 51 counties. Regional tabulations show that plant damage is limited to the San Francisco Bay area and the coastal plain of southern California. The areas reporting plant damage are those of greatest population density. The toxicants responsible for plant damage are recognized in decreasing order of importance as oxidized hydrocarbons, ethylene and fluorides. Sulfur dioxide is of unusual occurrence and its distribution usually associated with specific industrial wastes. It is generally believed that ozone is present in the urban areas of Los Angeles and San Francisco and responsible for a significant part of the total atmospheric pollution. The wide-spread distribution of ethylene and many of reaction products from the oxidation of hydrocarbons, emphasizes the need for regional, research and abatement programs.##

03615

J. T. Middleton

PHOTOCHEMICAL AIR POLLUTION DAMAGE TO PLANTS. Ann. Rev. Plant Physiol., No. 12:431-448, 1961.

The toxic components in photochemical air pollution are typically the oxidation products of hydrocarbons and result either from the dark reaction of ozone and olefins or the photolytic reaction of nitrogen oxides and hydrocarbons in the presence of sunlight. This paper describes the occurrence and distribution of photochemical air pollution, enumerate some of the raw materials and products of these oxidation systems responsible for plant damage, and indicate the biochemical, physiological, and pathological effects of these contaminants upon plants.##

03616

J. T. Middleton, A. S. Crafts, R. F. Brewer, G. C. Taylor

PLANT DAMAGE BY AIR POLLUTION. Calif. Agr. 9-12, June 1956.

In many of the important growing areas of California the production and quality of vegetables and crops are adversely affected by air-borne toxicants such as ethylene, fluorides, herbicides, oxidized hydrocarbons, ozone and sulfur dioxide. Injury to plants by oxidized hydrocarbons (smog) is distinctly different from crop damage by the other above named precursors. Leaves of celery, lettuce, spinach, and some other vegetables, and of flower crops and African violets usually show silvering and glazing on their lower surfaces, sometimes followed by a bronze or reddish discoloration. Examples of the plant damage are shown in color photographs. Visible injury to all crops in the Los Angeles areas has caused losses exceeding $1,000,000 annually since 1953. This does not include economic losses from reduced growth and lowered production in the absence of visible injury.##

03617

J. T. Middleton

RESPONSE OF PLANTS TO AIR POLLUTION. J. Air Pollution Control Assoc. 8, (1) 7-9,50, May 1958.

This article compares the relative susceptibility of some plants to oxidants to determine the plant-damaging effects of hydrocarbon, ozone, and ozonated olefins, and to describe the response of the pinto bean to air borne oxidants occurring in the Los Angeles area. Plants vary in their susceptibility

to the reaction products from the oxidation of hydrocarbons. The pinto bean has been selected as a test plant for measuring the mechanisms of damage and some of the effects of oxidized hydrocarbons upon the life processes. Controlled fumigations have shown that the severity of plant damage varies with the air temperature. The atmosphere in Los Angeles and San Francisco has allegedly high concentrations of ozone. Yet typical crop damage there is reproduced only by ozonated olefins and not by ozone alone. Glasshouse grown crops can be protected from damage by passing air through activated carbon filters. The response of plants to air pollution depends upon the type of pollutant present, its concentration, and the length of exposure to it. The specific symptoms incited by exposure to oxidants can be used to determine the presence of ozonated olefins and ozone in polluted air masses.##

03610

E. R. Stephens, E. F. Darley, O. C. Taylor, W. E. Scott

PHOTOCHEMICAL REACTION PRODUCTS IN AIR POLLUTION. Intern. J. Air Water Pollution 4, (1/2) 79-100, 1961. (Presented at the 25th Midyear Meeting, American Petroleum Inst. Division of Refining, Detroit, Mich., May 11, 1960.)

When low concentrations of simple olefins and nitrogen oxides in air are irradiated with artificial sunlight, the olefin molecule splits at the double bond. One end forms a carbonyl compound, and the other yields a variety of products. Among these is a highly oxidized, unstable organic nitrogen compound previously described as compound F or peroxyacetyl nitrite (PAN) and detected in polluted atmospheres. This compound has now been purified by gas chromatographic techniques, and its chemical, physical, and physiological properties have been examined. At concentrations well below 1 p.p.m. in air, this compound produces damage symptoms on plants, similar to those observed from oxidant air pollution but different in some respects from the phytotoxicant from ozone-olefin reactions. PAN is the first pure compound isolated from photochemical reaction mixtures which has been found to produce the characteristic oxidant damage symptoms. It is also a strong eye irritant at concentrations in the 1 p.p.m. range and is therefore probably responsible, along with acrolein and formaldehyde, for the eye irritation in photochemical air pollution. (Author abstract)##

03677

G. W. Todd

EFFECT OF OZONE AND OZONATED 1-HEXENE ON RESPIRATORY AND PHOTOSYNTHESIS OF LEAVES. Plant Physiol. 33, (6) 416-20, Nov. 1958.

The treatment of Pinto bean leaves with either ozone or ozonated hexene gas in air caused a rise in the respiration rate up to more than four times that of untreated control leaves. Plant responses to the two gases were similar. The rate of photosynthesis of treated bean leaves was less than that of controls. Both the amounts of stimulation of respiration and the inhibition of photosynthesis were directly related to the development of visible injury symptoms in certain tissues of the bean leaves. No stimulation of bean leaf respiration or inhibition of photosynthesis occurred unless visible injury developed. However, ozone caused a rise in the respiration rate of Valencia orange leaves with no concomitant development of visible injury. Citrus leaves gave no response until ozone concentrations approached those required to produce visible injury symptoms. Treatment with ozonated hexene at concentrations eliciting changes in respiration and photosynthesis in bean leaves caused no change in these processes in citrus leaves. A comparison of ozone- and ozonated hexene-treated bean leaves showed that the respiratory quotients were not different from that of the control leaves. (Author abstract)##

0 1679

0 1679
G. W. Todd

PHYSIOLOGICAL RESPONSES OF PLANTS TO AIR POLLUTANTS. J. Appl. Nutr. 10, 456-8, 1957. (Presented at the 20th Annual National Convention, American Academy of Nutrition, Los Angeles, Calif., 1956.)

The mechanisms whereby plants are damaged and the various ways in which they may show manifestations after fumigation by air pollutants are reviewed. The discussion is primarily concerned with the effects of ozone, ozonated unsaturated hydrocarbons, naturally-occurring air pollutants in the Los Angeles basin, and to a small extent hydrogen fluoride.##

0 1680

G. W. Todd and H. J. Gerber

SOME EFFECTS OF AIR POLLUTANTS ON THE GROWTH AND PRODUCTIVITY OF PLANTS. Botan. Gaz. 120, (2) 75-80, Dec. 1958.

Fumigations with ozonated hexene caused a suppression in growth of bean plants (varieties Red Kidney and Dwarf Gem) even though they showed no visible symptoms of injury. This effect was evident from measurements of linear growth, leaf area, fresh and dry weights, and fruit production. Both primary and trifoliolate leaves failed to enlarge as much as control leaves when treated with ozonated hexene, although the treatment seemed to have little or no effect on the number of leaves initiated. Primary leaves on treated plants aged and were lost prematurely. Stems of plants treated with ozonated hexene consistently had a higher water

content than did stems of control plants. The leaves did not show this relationship. The height growth of pea plants (variety Alaska) was slowed temporarily by as little as a single half-hour fumigation with ozonated hexane, although treated plants fully recovered and were growing normally 1 or 2 days later. Ozone alone caused no repression of growth, and repeated fumigations of pea plants with 1-hexene elicited no response. (Author summary)##

01781

B. N. F. Atkins, P. C. Chadwick, and A. C. Chamberlain

DEPOSITION OF RADIOACTIVE METHYL IODIDE TO VEGETATION. Health Phys. 13, (1) 91-8, Jan. 1967.

It is well established that a proportion of radio-iodine released from irradiated fuel elements or other sources may appear as methyl iodide. Methods for removing methyl iodide from gas-cooled reactor systems have been developed, but it is desirable to know the possible hazards of release of radio-iodine as methyl iodide to the atmosphere. As regards the inhalation of effluent by persons in the vicinity, it makes little difference whether the iodine is elemental or as methyl iodide, since experiments with human volunteers have shown that the uptake of methyl iodide vapour by the lung is substantial and rapid.
However, the hazard from contamination of milk supplies depends on the transfer of iodine vapour from the air to grass. To enable the hazard from release of methyl iodide to be assessed, two experiments were done to determine the velocity of deposition of methyl iodide, tagged with radio-iodine to vegetation. Both laboratory and field experiments indicate that methyl iodide is very poorly absorbed by vegetation. Although care was taken to remove any elemental iodine from the sources used, it is possible that the observed small uptake was due to traces of iodine. For assessment of hazards, the grass-milk route of entry is unlikely to be serious compared with the inhalation route for methyl iodide. There is, however, the possibility that prolonged exposure of a cloud of methyl iodide to sunlight might lead to dissociation and formation of elemental iodine, which would then be available to plants.##

04256

A. S. Burakhovich

ATMOSPHERIC POLLUTION BY DISCHARGES FROM CHEMICAL PLANTS. (Zagryazneniia atmosfernogo vozdukha vybrosami khimicheskikh predpriiatii.) Hyg. Sanit. 31, (9) 437-40, Aug. 1966. Russ. (Tr.)
CFSTI: TT 66-51160/1-9

The purpose of the investigations was the determination of one-time concentrations of injurious substances in the ambient air of populated areas within a radius of 3000-4000 m. from two chemical

plants. Among the substances included in the determinations were: nitrogen oxides, methanol, ammonia, hydrogen sulfide, formaldehyde, and cyclohexane. The effect of emissions from a power plant, on coniferous forests, was also studied. Needles from dried trees contained greater concentrations of sulfur compounds than needles from healthy trees.##

08586

H. E. Stokinger

EFFECT OF AIR POLLUTANTS ON WILDLIFE. Conn. Med. 27, (8) 487-92, Aug. 1963.

A review of information derived from both field and laboratory investigations of the effects of air pollutants on terrestrial animals indicates that (1) of all known air pollutants, economic poisons pose the greatest current threat to the health of wildlife. (2) Inorganic substances, (certain heavy metals and fluorides), account for limited and local injury to wildlife based on known effects on domestic animals. (3) The hazard to wildlife is chiefly from ingestion of the "fallout" of the air pollutant. (4) Relative species susceptibility to specific air pollutants is far from clear, but it would appear that the mammals are considerably more susceptible than birds. (5) Laboratory studies have revealed three rather general phenomena associated with exposure to air pollutants: a. Synergism, the exalted or potentiated toxic effect of combination of certain air pollutants: its converse, antagonism, in which the expected toxicity is either far less than predicted or nonexistent. b. Tolerance and cross tolerance to pulmonary edema-producing agents. c. The immunochemical response.##

08588

F. W. Tiedemann

IMPURITIES IN THE AIR AND THEIR INFLUENCE ON PLANT LIFE. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949 pp. 135-41

The fact that several impurities in the air influence plant life has been fairly well established. The toxic impurities most frequently encountered are sulphur dioxide, hydrogen fluoride, chlorine, hydrogen sulphide, ammonia, certain of growth-regulating substances, and constituents of manufactured illuminating gas. To aid in identifying characteristic effects, several species of plants have been subjected to these gases under controlled experimental conditions.##

04998

H. H. Hull F. W. Went

LIFE PROCESSES OF PLANTS AS AFFECTED BY AIR POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 122-8.

Either natural smog or artificial smog produced by the oxonization of 1, n-hexene or gasoline vapor was used. Plants used included: alfalfa, var. Chilian; sugar beet, var. U.S. 22/3; endive, var. Pink Ribbed; oats, var. Ranota; spinach, var. Virofley; and tomato, var. San Jose Canner. A sensitive biological assay for detection of phytotoxic constituents in the atmosphere is described. Differential sensitivity of cotyledons and young foliage leaves to smog injury was observed. The growth of alfalfa, and especially of endive, has been greatly increased by carbon filtration of the atmosphere. Tomato plants' growth was very significantly greater in the carbon-filtered air. An iron-zinc-steel wool filter was practically as efficient as the activated carbon, as indicated by the luxurious growth of all five plants. The effect of smog on growth, transpiration, and stomatal behavior was examined. The effects of temperature, illumination, humidity, and soil moisture on the sensitivity of the plants to smog was studied. The effect of ferrous sulphate, stannous chloride and sucrose sprays upon the plants' susceptibility to smog injury was studied. The sensitivity of several different species of plants and of different types of spinach to smog damage was investigated.##

04999

H. A. Robbay

THE ANATOMICAL EFFECTS OF AIR POLLUTION ON PLANTS. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 129-34.

The damaging effects on the leaf anatomy of susceptible crop plants were investigated. The leaf was considered to be the logical point of departure, since it almost invariably manifests physical response to smog within a very brief exposure period. The structure of the normal leaves was very carefully observed in order to enable detection of even the slightest alteration in cell shape. From careful comparative studies made of the cellular structure of normal and damaged leaves, it was possible to establish the microscopic anatomy of smog damage. Regardless of the macroscopic picture of damage, microscopic studies indicate that the reaction of the cell to hydrocarbon-ozone products is the same in all susceptible plants. The plants studied were table beet, sugar beet, romaine lettuce, spinach, Swiss chard, endive, oats, and corn.##

05161

W. A. Noble

THE RELATION OF PLANT DAMAGE TO FUEL COMPOSITION. Preprint. (Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961.)

Plants exposed to irradiated auto exhaust gases containing initially less than 0.5 ppm of olefins and less than 2 ppm of NO exhibit the same symptoms of damage as do plants exposed to the atmosphere in the Los Angeles area. The plants used in these studies were Poa annua and petunia, var. Rosy Morn. The symptoms observed were banding, necrosis, glazing, silvering, and cellular plasmolysis in substomatal regions. Exposure time was 1 hour. Exposures were initiated at half hour intervals. Poa annua was the most useful plant because of its greater range, simplicity of evaluation, and uniformity and also because a larger number of plants could be used in a given space. The length of exposure required for the production of maximum damage appears to be related to the reaction rate of the fumigants, which depends in part on fuel bromine number and on the concentrations of the fumigants. Differences in concentrations also produced marked differences in the degree of damage. (Author abstract) **

05147

Bailey, R. F., Nichols, C. W. and Middleton, J. T.

IDENTIFICATION OF AIR POLLUTION DAMAGE TO AGRICULTURAL CROPS. (AIR POLLUTION RESEARCH REVEALS CHEMICAL TOXICANTS INJURING VEGETATION IN POPULOUS AREAS OF CALIFORNIA.) Calif. Dep. Agri. Bull., 55(1):11-19, 1966.

The subject of this paper is the damage air pollution does to the plants that feed us, clothe us and please our aesthetic sense. This damage is considerable. Estimates of visible damage to agricultural crops amount annually to about $8 million in California and approximately $10 million along the Atlantic seaboard. Damage to vegetation has increased with industrialization and urban development. Several decades ago sulfur dioxide and fluorine were recognized as the principal plant toxicants. These two gases continue to be very important but within the last 20 years a new group of toxicants has been identified. These are products of atmospheric photochemical reactions between hydrocarbons and nitrogen oxides. The principal products of these reactions are ozone and the peroxyacyl nitrates (PANs). The distribution of plant damage in California shows that it occurs only in recognized geographical areas which, in each instance, are located within airsheds. Because damage to plants is often the first indication of air pollution, it is important that the surveillance of pollution damage to agriculture be continued. Such information will help communities, in their planning, to take cognisance of the relationship between the air resource and the community needs for commercial and industrial development, energy

production, fuel usage and transportation, agriculture, and forest and recreation land. The air contaminants responsible for damage may be either particulate or gaseous in nature. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements.

05344

Darley, E. F., and Middleton, J. T.

PROBLEMS OF AIR POLLUTION IN PLANT PATHOLOGY. Ann. Rev. Phytopathol. 4, 101-18, 1966.

Air quality affects plant growth and development. Whereas oxygen is necessary for aerobic plant respiration and carbon dioxide is necessary for photosynthesis in green plants, a number of pollutants may alter plant metabolism and incite disease. It is the purpose of this paper to enumerate some of the principal air pollutants which adversely affect plant growth and reproduction, to describe the diseases incited by them, and to identify some of the problems of air pollution in phytopathological research. A primary responsibility of the pathologist is to alert agriculturists of impending air-pollution problems, so that social action may be taken to insure the continued productivity of crop, pasture, and forestry enterprises. Another responsibility, because plants are early indicators of an air pollution problem, is to assist public health and resource agencies in the planning, conduct, and evaluation of air-pollution abatement programs. Plant pathologists must become increasingly concerned with the effects of air quality on plant growth.

05421

Merriman, G. R.

FLUORIDES AND OTHER CHEMICAL AIR POLLUTANTS AFFECTING ANIMALS. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 91-95, 1967. 11 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C., 1966.)

A review of air pollution problems involving animals is presented. One pattern of procedures useful in investigating and controlling the effects of chemical air pollution upon animals was developed during United States and British studies of effects of fluoride effluents upon cattle. Generally the effluents collected upon the surfaces of vegetation and exerted their effects only after ingestion by animals. The investigational procedures included methods of detecting pollutant effects upon animals, diagnosis and evaluation of effects, consideration of pollutant sources, and pollutant control as related to animal well-being. All procedures depended on research with laboratory and farm animals.##

05420

Daines, R. H., I. A. Leon, and E. Brennan

AIR POLLUTION AND PLANT RESPONSE IN THE NORTHEASTERN UNITED STATES. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.); American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 11-37, 1967. 56 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C. Dec. 1966.)

A review of pollutants that have been found to elicit plant response is confined to the discussion of acid gases, primary products of combustion, and products of reactions occurring in the atmosphere. Other topics discussed include: plant response as an indicator of meteorological conditions and the fuels used for heat, light, and power.**

05465

W. H. Hobie

AIR POLLUTANTS. Lasca Leaves. 15 (1), 7-18 (Jan. 1965).

After years of careful study, some of the components of smog have been sorted out. The more important ones, their effects on vegetation, and a list of sensitive and resistant plants are discussed. The components are peroxyacetyl nitrate, ozone, ethylene, hydrogen fluoride, sulfur dioxide and aerosols.**

05610

W. W. Heck

PLANT INJURY INDUCED BY PHOTOCHEMICAL REACTION PRODUCTS OF PROPYLENE-NITROGEN DIOXIDE MIXTURES. J. Air Pollution Control Assoc. 14(7):255-261, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Plants developed typical ethylene injury symptoms when fumigated for 21 to 48 hr with ethylene or various combinations of ethylene, acetylene, propylene and nitrogen dioxide. When propylene and nitrogen dioxide were included in the gas mixture and the mixture irradiated typical oxidant symptoms were recorded. Slight to severe necrotic spotting, due to nitrogen dioxide, was noted in a 48 hr fumigation at one ppm nitrogen dioxide and in a 21 hr fumigation at 1.5 ppm nitrogen dioxide. Twelve hour fumigations using irradiated mixtures of ethylene, acetylene and propylene at three concentrations (2.5, and 8 ppm) each in combination with one ppm of nitrogen dioxide gave typical oxidant damage with only the propylene-nitrogen dioxide mixtures. From reported oxidant injury symptoms the propylene-nitrogen dioxide irradiated mixture

produced plant injury which is typical of both ozone and PAN. The presence of other phytotoxicants was not discounted but the severity of injury, under the conditions used, made it difficult to evaluate other possible types of oxidant damage. The production of the phytotoxicants using various ratios of propylene-nitrogen dioxide mixes was determined using the plants as biological indicators. A ratio of one ppm NO2 to 2-3 ppm propylene produced the highest concentration of the phytotoxicants. The effects of varying light and temperature conditions during the fumigation period indicated that plants must be in the light before they are sensitive to oxidant damage and that a temperature above or below normal will reduce oxidant injury. Results stress the need for studying the interrelations of oxidant injury and various environmental factors. (Author's summary)##

05865

Brewer, R. F. Guillemet, F. B. and Creveling, R. K.

INFLUENCE OF N-P-K FERTILIZATION ON INCIDENCE AND SEVERITY OF OXIDANT INJURY TO RANGELES AND SPINACH. Soil Sci. 92, (5) 298-301, Nov. 1961.

The study reported in this paper was designed to further study the influence of nitrogen supply and explore the possible effects of potassium and phosphorus supply on the sensitivity of plants to oxidant damage. Several Rangel seed (Burpee No. 5111) were planted in 1-gallon cans filled with a previously fertilized soil-sand-peat mixture. After emergence the plants were thinned to one plant per can. Twelve different treatments, each replicated 8 times, were used in a 3 x 2 x 2 factorial design consisting of 3 levels of N and 2 each of P and K. Two months after emergence, half the plants, chosen at random, were placed in a special greenhouse fumigation chamber and exposed to ozonated benzene. The remaining Rangels were placed in a duplicate fumigation chamber which received activated-carbon-filtered air to remove ambient oxidants. At the end of 2 days, during which the one group of plants was exposed to two 6-hour fumigations with an average organic oxidant concentration of 0.01 ppm., all the plants (fumigated and controls) were returned to the smog-free greenhouse where they were grown. Thirty-six hours after fumigation was stopped the plants were systematically examined for incidence and severity of damage. A similar experiment was conducted using spinach as the test plant. A statistical analysis of the Rangel fumigation data indicate that the severity of injury was very significantly increased as the nitrogen level was increased. There were also highly significant interactions of nitrogen with phosphorus and between phosphorus and potassium on severity of injury. The results of differential fertilization on the sensitivity of spinach to ozone injury indicate that increasing the nitrogen supply very significantly increased both the incidence and the severity of ozone injury. fertilization on the sensitivity of spinach to ozone injury.

05721

J. B. Hendrick, Jr., E. F. Darley, and J. T. Middleton

CHEMOTHERAPY FOR OXIDANT AND OZONE INDUCED PLANT DAMAGE. Intern. J. Air Water Pollution 6, 391-402 (1963).

A number of common fungicides, as well as antioxidants from the rubber industry, were dusted and sprayed onto leaves of test plants to determine their efficacy, as well as their mode of action, in protecting plants from subsequent exposure to ozone and oxidants generated from ozonated hydrocarbons. Not all chemicals were equally effective. Some protected against both ozone and oxidants, some protected against one but not the other, while some gave no protection. The most effective materials were dithiocarbamates, mercaptobenzothiazole and their derivatives, while the least effective were amine derivatives. The degree of protection was directly related to concentration of chemical. Longevity of protection was related to accumulated periods of exposure to toxicants. Over a 10-hour accumulated exposure period plants were significantly protected, although the degree of injury gradually increased with exposure time. In contrast, when several days lapsed between application and exposure, the chemical was as effective as when applied on the day of exposure. Action of the protectant was local and not systemic; the toxicant appeared to be deactivated at the leaf surface. Leaves remained free of injury only when the chemical was applied to the lower leaf surface and then only on that portion actually covered with chemical. Some degree of protection was achieved in field tests against atmospheric oxidants as well as against those generated in the laboratory. (Author abstract)##

05726

J. B. Kendrick, Jr., E. F. Darley, J. T. Middleton, and A. C. Paulus

PLANT RESPONSE TO POLLUTED AIR. Calif. Agr. 10 (8), 9-10 (Aug. 1956).

Field observations and controlled fumigation experiments have shown that plants differ in their response to atmospheric contamination by ethylene, herbicides, fluorides, sulfur dioxide, and smog, or oxidized hydrocarbons. Controlled experiments have also shown that plant response to air pollution varies with species and variety of plant, age of plant tissue, soil fertility levels, soil moisture, air temperatures during the prefumigation growth period, and presence of certain agricultural chemicals on leaves. Plants also vary in their susceptibility to sulfur dioxide, with alfalfa, barley, and cotton damaged at comparatively low levels, and citrus, corn, celery, and melons damaged at much higher levels. Field observations show that young leaves are seldom marked during periods of aggravated air pollution. The young, unexpanded leaves are typically uninjured; the mature, expanded leaves are severely injured; and the old, somewhat chlorotic leaves are rarely damaged. In grasses, where the youngest tissue is at the base of the leaf, injury first occurs at the tip, grading off in intensity of injury toward the base of the leaf. Old chlorotic leaves on grasses are seldom injured. Several groups of chemical compounds are capable of preventing injury to plants caused by oxidized hydrocarbon fumigations when the chemicals are applied to the lower surface of leaves. These chemicals belong to the

dithiocarbamate, benzothiazole, and thiuram sulfide groups, and have been used extensively as agricultural fungicides for the control of many fungus diseases. Two of the best chemicals for this purpose are zineb--zinc ethylenebisdithiocarbamate --; and thiram--tetramethyl thiuramdisulfide. The degree of protection is directly related to the amount of active ingredient contained in the spray or dust preparations. Protection is achieved only when the underside of leaves are adequately covered. Both groups of chemicals when properly applied to laboratory test plants protect leaves from damage from both ozone and ozonated hexane. Pinto bean leaves dusted with zineb in the laboratory and exposed to naturally polluted air near Los Angeles were protected from serious injury.##

05756

Rasmussen, R. A. and Went, F. W.

VOLATILE ORGANIC MATERIAL OF PLANT ORIGIN IN THE ATMOSPHERE. Proc. Natl. Acad. Sci. (U.S.) 53, (1) 215-20, Jan. 1965. (Presented before the National Academy of Sciences, Apr. 27, 1964.)

Quantitative data on the actual concentration of plant volatiles in air are given. Using a sensitive gas chromatograph mounted in a mobile trailer laboratory, the presence in air of many organic compounds in molecularly disperse state can easily be measured. The hydrogen flame detector, which responds only to organic molecules, has a sensitivity of better than 1:10 to the 9th power, using 5-cc air samples. Whereas in cities gasoline and other man-produced organic vapors constitute the bulk of the organic volatiles in the air, in the countryside, away from highways and human activities, plant products predominate. Among these, alpha- and beta-pinene, myrcene, and isoprene were identified. Their concentration depends on meteorological conditions and density and activity of plant covers; during summer usually more than 10 to the minus 8th power organic volatiles occur in country or forest air; during winter this decreases to 2 x 10 to the minus 9th power. After one or more dark rainy days plants release less terpene. Upon the death of cells large amounts of terpenes are released, explaining the aromaticity of drying hay or of forests during autumn. High concentrations of terpenes in the air were associated with the dying of leaves in autumn, and with the mowing of meadows. A world production for plant volatiles released to the atmosphere is estimated to be 438 x 1,000,000 tons per year. (Author conclusions)

05777

G. W. Todd B. Propst

CHANGES IN TRANSPIRATION AND PHOTOSYNTHETIC RATES OF VARIOUS LEAVES DURING TREATMENT WITH OZONATED HEXENE OR OZONE GAS. Physiol. Plantarum 16, 57-65, 1963.

Measurements were made on the rates of photosynthesis and transpiration of bean, tomato and coleus leaves during and immediately following fumigation with either ozone or ozonated hexene gas. Both fumigants caused marked decreases in the rate of photosynthesis in all 3 species although in tomato and coleus leaves, the reduction in photosynthesis took place only during fumigation with ozonated hexene gas and afterwards the rate returned to normal. Ozone fumigation caused decreases in transpiration but the decrease was not as large as that obtained for photosynthesis. Transpiration in tomato and coleus leaves showed little response to ozonated hexene gas although bean leaves responded in much the same way as they did when they were treated with ozone alone. The white portions of coleus leaves (where the green outer portion had been removed) were used for similar fumigations and an increase in respiration and a decrease in transpiration with ozonated hexene was noted. There were no changes in transpiration from leaves following ozone fumigations. Increases in respiration after ozone and ozonated hexene fumigations were obtained for bean, tomato and intact coleus leaves as had been reported previously for bean leaves. It was postulated that part of the decrease in growth (not accompanied by visible injury) obtained when plants were treated with ozonated hexene gas might be due directly to the reduction in photosynthesis. It would not appear in the species tested that the more resistant species close their stomates and thereby prevent the fumigant from entering. (Author summary) ##

05719

Todd, G. W. and Arnold, W. N.

AN EVALUATION OF METHODS USED TO DETERMINE INJURY TO PLANT LEAVES BY AIR POLLUTANTS. Botan. Gaz. 123, (2) 151-5, Dec. 1961.

An evaluation was made of three methods of analyzing the damage of plant leaves after exposure to ozone or ozonated hexene gas. A visual estimate was made of the amount of leaf surface damaged. The same plants were used for measurements of the change in fresh weight and of chlorophyll content. The latter two measurements were chosen because injury results in desiccation of parts of the leaf and a loss of pigmentation. Also there would be a measure of the actual amount of functional leaf material which was damaged. It was found that losses in fresh weight were nearly proportional to losses of chlorophyll in injured leaves. The visual-rating system appeared to be sensitive in the lower range of injury but rather insensitive at the upper end of the range. The visual-damage index appears to be logarithmic with respect to both chlorophyll and fresh-weight changes. It was concluded that a measurement of the change in either fresh weight or chlorophyll content would give a better estimate of impairment of leaf function, since the visual-damage system tends to overestimate the damage inflicted, particularly when only a small amount of leaf surface is involved. (Author summary)

05904

B. L. Richards, J. T. Middleton, and W. B. Hewitt

AIR POLLUTION WITH RELATION TO AGRONOMIC CROPS: V. OXIDANT STIPPLE OF GRAPE. Agron. J. 50, 559-61 (1958). (Presented at the 50th Anniversary Meeting, American Society of Agronomy, Nov. 20, 1957.)

Small, brown to black, discrete, punctate lesions occur on the upper leaf surface of grape grown in areas polluted by air-borne oxidants. The lesions are typically restricted to the palisade layer and may be easily distinguished from other grape disorders because of their stippled appearance. The disease can be incited in grape by fumigation with ozone. Toxic ozone levels occur in the polluted air mass above the Los Angeles and San Francisco areas where oxidant stipple is found. Stipple has not yet been seen in the grape producing areas in the Coachella, Napa, Sacramento, and San Joaquin valleys of California. Oxidant stipple can be distinguished from smog-type oxidant injury due to oxidized organics in that the upper leaf surface is stippled in grape and there is no common and pronounced silvering or glazing of the lower leaf surface as found on herbaceous crops and weeds in and adjacent to affected vineyards. Leaf injury to grape due to foliar fluoride accumulation can be readily distinguished because it is marginal red to brown in color, necrotic, and commonly exhibits zonate markings. Stipple can also be easily separated from foliar salinity and drought injury, both of which produce marginal and intercostal leaf necroses similar to those induced by fluorides. Although ozone occasionally may cause leaf injury to some plants particularly grasses, grown in areas receiving naturally polluted air, it is unusual to note ozone damage to agricultural crops; oxidant stipple of grape is, therefore, a unique disease both in its symptomology and etiology.##

06078

G. D. Clayton F. E. Platt

EVALUATION OF ETHYLENE AS AN AIR POLLUTANT AFFECTING PLANT LIFE. Am. Ind. Hyg. Assoc. J., 28(2):151-9 (Apr. 1967).

A comprehensive survey of the literature reveals that ethylene has been clearly implicated as an air pollutant only for certain greenhouse plants. Ethylene is produced naturally by some biologic systems and may cause some plant damage. Most studies have been in closed systems with shifts in gas concentrations occurring. Adequate data are lacking on the response of field-grown plants to ethylene as an air pollutant. (Author's abstract)##

06498

L. Ordin, and B. Propst

EFFECT OF PHOTOCHEMICALLY PRODUCED OXIDANTS ON GROWTH OF AVENA COLEOPTILE SECTIONS. Plant Physiol., 36(3), 326-30, (May 1961).

Avena coleoptile sections incubated in solutions through which photochemically produced oxidant mixtures, ozone or peroxyacetyl nitrate (PAN) are passed, display subsequent repressed growth in fresh solutions to which auxin has been supplied. Treatment by oxidant recording as 1.4 pps derived from an irradiated mixture of trans-2-butene and NO2 results in about 50% inhibition of elongation. About 1.5 pps PAN also inhibits growth to the same degree or more. Approximately 170 pps ozone produced comparable magnitudes of inhibition. In all cases basal respiration was inhibited little or not at all. Although the concentrations dealt with here are about tenfold above those found in the atmosphere (200-fold for ozone) the results may be helpful in the interpretation of mechanisms of growth inhibition in the field. There are probably several reasons why high concentrations of PAN are required to produce growth inhibition in Avena coleoptiles while much lower concentrations affect more sensitive intact plants. Although the coleoptile is cutinized and has few stomata, suggesting a transport barrier, there are indications that root tissue which is neither cutinized nor suberized to any great extent may be even less sensitive. Thus the answer is more likely to lie either in the resistance of the cellular membranes themselves to the uptake of the oxidants or in the presence of reducing agents in the cell or, simply, less sensitive enzyme systems. It was found that intact seedlings in the gas stream are not more sensitive than sections floating in water during gas exposure. The lack of illumination during exposure may also be a factor, since even sensitive petunia plants exposed in the dark to 0.5 pps oxidant derived from an irradiated mixture were not damaged.##

06499

L. Ordin and B. Propst

EFFECT OF AIR-BORNE OXIDANTS ON BIOLOGICAL ACTIVITY OF INDOLEACETIC ACID. Botan. Gaz. 123(3), 170-5 (Mar. 1962).

This investigation concerns the effects of some of the known atmospheric pollutants, namely ozone, peroxyacetyl nitrate (PAN), and ultraviolet-irradiated mixtures of olefin and NO2 on indoleacetic acid in vitro. It is apparent from the results that air-borne oxidants such as PAN and ozone can inactivate IAA in vitro. Whether such a mechanism of inactivation is of importance in the living plant cannot be answered fully at present. Ascorbic acid prevented the inactivation of IAA by chemically reducing the oxidant level in the solutions. The residual ascorbate, or its decomposition products, in the growth solutions exerted a slight subsequent inhibitory action on coleoptile growth. This observation does not agree with the results of other investigators.

Since the concentration of ascorbate was much higher in the present experiments than that used by other investigators, it is possible that the growth-stimulating range was exceeded in the present investigation. The failure of IAA activity to recover despite low residual amounts of PAN or ozone in solution and, more particularly, despite the addition of ascorbate to the previously treated solutions indicates that the inactivation is not similar to that caused by H2O2 or peroxides. In the peroxide-induced inactivation, there is an apparent interference with the bioassay rather than an \irreversible change. In the case of inactivation by ozone or PAN the change is irreversible as shown by the changes in ultraviolet spectra. Some light on this irreversible inactivation is shed by the ultraviolet spectra. They show that the change in IAA caused by ozone and PAN is probably a ring alteration.##

06546

W. W. Heck, F. G. Pires, and W. C. Hall

THE EFFECTS OF A LOW ETHYLENE CONCENTRATION ON THE GROWTH OF COTTON. J. Air Pollution Control Assoc. 11(12), 549-56 (Dec. 1961). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The present study was designed to determine the effects of a low level of ethylene on cotton grown under controlled conditions, during the entire growth period of the plants. The chambers were designed as gas-tight compartments with controls for the following conditions: light, temperature, humidity, water, air flow, and gas concentration. Plants were grown for one month and the chambers then opened for an eight hour period. The following quantitiative data were obtained for all plants: plant height; the number of cotyledons, leaves, squares (flower buds), flowers, bolls, laterals, and nodes; the number of plant parts abscissed; and the leaf size in square inches. Preliminary experiments indicated that cotton was very sensitive to ethylene air pollution. Thus it was decided to grow plants from the seedling stage through maturity at an ethylene level which might readily prevail in the vicinity of a polyethylene industrial plant. The level of 0.6 ppm was chosen as a possible mean level of ethylene air pollution.##

07167

Abeles, Frederick B.

INHIBITION OF FLOWERING IN XANTHIUM PENNSYLVANICUM WALLR. BY ETHYLENE. Dept. of the Army, Fort Detrick, Md. Biological Sciences Lab., Project 1L013001A91A, Technical Manuscript 376, 5p., April 1967. 11 refs.
CFSTI: AD 813720

In this report ethylene inhibited the formation of flowers in cocklebur (Xanthium pensylvanicum Wallr.) plants that were exposed to an inductive dark period. Indoleacetic acid had been shown earlier to have this same effect. The two large apical beaks were cut from cocklebur fruits (Chicago strain) and the fruits were washed in running water for 24 hours and planted in 4-inch pots of soil; seedlings were grown for 3 weeks at 25 C on a 16-hour light cycle (1,500 ft-c) supplied by daylight fluorescent bulbs. The plants were induced to flower by exposure to 16 hours of darkness in 10-liter desiccators containing 0, 1, 10, or 100 ppm ethylene. After the induction period, the plants were returned to the growth chamber; the sizes of the inflorescences were measured 8 weeks later. Ethylene evolution from the plants was measured by gas chromatography. Because it stimulates ethylene evolution from cocklebur leaves, the results suggest that the effect of auxin may be an ethylene effect.##

07446

A. Ongun, J. B. Mudd

BIOSYNTHESIS OF GALACTOLIPIDS IN PLANTS. Preprint, California Univ., Riverside, Dept. of Biochemistry and Statewide Air Pollution Research Center, ((36))p. 1967. 25 refs.

Spinach chloroplasts very actively incorporated radioactivity from UDP-galactose C14 into lipids. Among the products formed, monogalactosyl and digalactosyl diglycerides together with a third compound, tentatively identified as the trigalactosyl diglyceride, contained 95% of the total identified as the trigalactosyl diglyceride, contained 95% of the total lipid radioactivity. Chloroplasts from young leaves showed higher enzyme activity than those obtained from mature leaves. Dissociation of the enzymes from the acceptors was accomplished by acetone powder preparation of the chloroplasts. It was shown that diolein could serve as an efficient acceptor for the monogalactosyl diglyceride synthesis but not for the digalactosyl diglyceride synthesis. Monogalactosyl diglyceride, naturally found in chloroplasts, was shown to be the acceptor for the second galactosylation. Incubation of radioactive digalactosyl diglyceride with the acetone powder of spinach chloroplasts resulted in the formation of trigalactosyl diglyceride when cold UPD-galactose was used as the substrate. Evidence indicated that two enzymes were involved in galactolipid synthesis in spinach chloroplasts. The enzyme responsible for the synthesis of monogalactosyl diglyceride was more tightly bound to the membranes than the enzyme synthesizing digalactosyl diglyceride. Particles from etiolated pea leaves as well as other non-chlorophyllous tissues were shown to contain active enzymes that synthesize the galactolipids. A light induced increase in the enzyme activity was observed in pea leaves. (Authors' summary)##

10099

Shabad, L. M.

ON THE DISTRIBUTION AND THE PATH OF THE CARCINOGENIC HYDROCARBON BENZ(A)PYRENE (3,4 BENZPYRENE) IN THE SOIL. Z. Krebsforsch. (Berlin), 70(3):208-210, Jan. 5, 1968. 20 refs.

Soil samples from seven areas of Moscow were taken and 10 gm. portions extracted with benzene, followed by fluorometric analysis to determine the quantities of benz(a)pyrene (BP). No BP was found in the control samples taken from resting land near a water reservoir but the highest level of (191.00 gamma/kg.) was found in soil near large factories which were known to discharge large quantities of carcinogenic hydrocarbons. Within Moscow, soil was slightly polluted, with 436.5 gamma/kg. found in a district with old buildings with an asphalt plant, and 104.5 gamma/kg. in a district with new housing. An industrial suburb had 81.6 gamma/kg. and a field near Moscow had 79.1 gamma/kg. The suburb was polluted by a railroad station and the field was very close to a well-traveled highway. Thus, soil pollution depends on the overall pollution of the environment and may serve as an indicator of the level of BP air pollution. Some investigators have found air pollution to spread at least 3 km. around factories, with intensity dependent upon wind direction. The level of BP on vegetation was also examined. Plants from the vicinity of the factory were found t carry 600-5900 gamma/kg. of BP before washing, and slightly less (40 1900) after washing. More BP was found in plants with broad, level leaves than in those with narrow, vertical ones. Three test strains of soil bacteria actively destroy BP CONTENT IN SOIL SAMPLES taken near an oil refinery. The amount of transformed BP can reach 53% in four days. Thus, carcinogenic hydrocarbons can fall on soil, appear in water, can be accumulated in soil or disappear, can be destroyed by soil microorganisms, or pass into plants.

10116

Lassetar, John Luther

DISTRIBUTION AND NATURE OF SURFACE WAX IN FUNGAL SPORES AND MECHANISMS OF WAX BIOSYNTHESIS IN BRASSICA OLERACEA. Thesis (Ph. D) Houston Univ., Tex., June 1968, (8) p.

Normal alkanes were common in surface waxes of all Basidiomycete chlamydospores and uredospores analyzed as well as the conidiospores for the Ascomycete studied. The spore samples were extracted with organic solvents, the extracts fractionated by silica gel chromatography and then analyzed by gas chromatography and by a gas chromatographic- mass spectrometric technique. Odd carbon-numbered alkanes predominated. Carbon numbers ranged from C18 to C37. The major n- alkane components and total hydrocarbons present were C27 for Ustilago maydis (40 ppm), C29 for Puccinia graminis (105 ppm), C29 and C31 for Uromycetis appendiculi (126 ppm), C27 and C25 for Ustilago nuda (58 ppm), C29 and C31 for Ustilago avenae (51 ppm) and C29 for Sphacelotheca reiliana (196 ppm). The conidiospores of Aspergillus niger had n-C25 as the predominant alkane and a total of

5-10 ppm hydrocarbons present. For the most part the aldehydes present in fungal spores were similar to the distribution known to occur in many higher plants; however, each spore type possessed a different distribution pattern. (Author's abstract)

11010

Smith, M. E.

THE INFLUENCE OF ATMOSPHERIC DISPERSION ON THE EXPOSURE OF PLANTS TO AIRBORNE POLLUTANTS. Phytopathology, 58(8):1085-1088, Aug. 1968.

Variations in atmospheric dispersion and the typically nonuniform distribution of pollutant sources cause wide fluctuations in pollutant concentrations at a fixed point on the ground. These variations in concentrations are usually correlated with other meteorological parameters, time of day, and the levels of other pollutants. The details of this variability differ strikingly, depending upon the relative location of the plants and the sources and upon the climatology of the area in which the problem exists. An outline of the magnitude and time scales of these fluctuations is presented. Specific correlations with other factors that may be important in designing meaningful dosage tests for pollutants are indicated. Without tests that simulate conditions in the normal atmosphere, laboratory experiments will be misleading, and apparent sensitivities may bear little relation to the response of the plant in the field.##

11072

Heck, Walter W.

FACTORS EFFECTING THE RESPONSE OF PLANTS TO OXIDANT AIR POLLUTANTS. Preprint, Dept. of Agriculture, Washington, D. C., Agricultural Research Service and Public Health Service, Washington, D. C., National Air Pollution Control Administration, 9p., ((1968)). 6 refs.

The effects of oxidants in general, including ethylene and NOx on plants are discussed. The problems of chronic plant damage and synergistic effects, such as those discovered for ozone-SO2 mixtures, are considered and are shown to be difficult to detect and evaluate. Projections of ozone concentration producing injury in various plants are presented, and the topics of crop yield reduction and land use are briefly covered.##

11100

Abeles, F. B., and H. H. Gahagen, III

ABSCISSION: THE ROLE OF ETHYLENE, ETHYLENE ANALOGUES, CARBON

DIOXIDE, AND OXYGEN. (TECHNICAL MANUSCRIPT.) Dept. of the Army, Frederick, Md., Plant Sciences Lab., Proj. 1B522301A061, TR-462, 15p., June 1968. 25 refs.

For hexane, ethylene was the most effective abscission accelerant examined, with decreasing activity shown by propane, carbon monoxide, dioxide, acetylene, vinyl fluoride, 1-butene, and 1,3-butadiene. Carbon dioxide inhibited abscission, but its effect was overcome by ethylene. Oxygen was required for abscission as an electron acceptor for respiration and not as a potentiator or activator of the ethylene attachment site. The molecular requirements for abscission were similar to those shown by other workers for other biological processes under the influence of ethylene. (Authors' abstract)##

12042

Heggestad, H. E.

DISEASES OF CROPS AND ORNAMENTAL PLANTS INCITED BY AIR POLLUTANTS. Phytopathology, 58:1089-1097, Aug. 1968. 80 ref.

Air pollution injury to crop and ornamental plants is increasing in the U.S.A. Estimates of annual losses to agriculture from air pollutants, which ranged from $150 to $500 million during the decade 1951-1960, are now $500 million. Although most of the loss is due to growth suppression or chronic injury, it is the acute injury that suggests the nature of the air pollutant and reveals the distribution of the problem. Each pollutant tends to produce its own pattern of injury, leaving graphic records of air pollution episodes. Photochemical oxidants, ethylene, sulfur dioxide, fluoride, and other pollutants produce marked reactions in various types of plants. The recent developments and current research trends in the assessment of these reactions are reviewed.##

14045

Johnson, H.

THE HIGH COST OF FOUL AIR. The Progressive Farmer, 4 pp., April 1968.

The President's Science Advisory Committee reported in 1965 that air pollution damage to plants had been observed in 27 states, the District of Columbia, Canada, and Mexico. Total damage each year to crops in the United States is estimated at $500 million. Weather fleck damage to tobacco, which is caused by ozone, has caused substantial crop loss in all producing states. Sulfur dioxide, fluorine, ethylene, and photochemical smog are known to be harmful to plants. A research progres to solve unanswered questions, and a progras to enforce the cleaning up of pollution sources is urgently needed.##

16968

Daines, Robert H., Eileen Brennan, and Ida Leone

AIR POLLUTANTS AND PLANT RESPONSE. J. Forestry, 65(6):381-388, June 1967. 15 refs.

The effects of a number of acid gases and photochemically-produced pollutants on plants are described. A great variation in susceptibility to damage by such gases as fluorides and SO2 exist both among plant species and within a single species. Injury from these gases occurs primarily to younger leaves, with little or no damage shown by old leaves. Symptoms usually consist of marginal and tip necrosis with accompanying discoloration of the affected areas. Limited studies with chlorine suggest that it is less phytotoxic than hydrofluoric acid, requiring about 0.1 ppm to injure the more sensitive plants. Among the photochemically-produced pollutants, ozone has been known for many years to be toxic to a wide variety of plant species; ozone toxicity symptoms appear as flecks, stipple, streaks, spots, and tip necrosis. Injury appears on mature leaves, with the oldest leaves of young plants and middle-aged leaves of old plants being most susceptible. Peroxyacetylnitrate (PAN) and its analogues are highly phytotoxic, producing symptoms called 'silver leaf' and 'leaf banding' in California, the northeastern U. S., and other urbanized areas. Like ozone, these compounds are believed to cause severe annual economic losses in crop damage. Investigations of damage caused by other photochemical pollutants, namely ozonated hydrocarbons, bisulfite reaction products, and nitrogen dioxide, are briefly summarized, and the major sources of all the pollutants discussed are noted.

16357

Otto, Harry W. and Robert H. Daines

GENESIS OF PHYTOTOXIC AIR POLLUTANTS AND THEIR IDENTIFICATION AND MEASUREMENT BY CHEMICAL AND PHYTOLOGICAL METHODS. IEEE (Inst. Elec. Eotron. Engrs.) Trans. Geosci. Electron., GE-8(1):59-69, Jan. 1970. 105 refs. (Presented at the First Annual International Geoscience Electronics Symposium, Washington, D. C., April 1969.)

Phototoxic air pollutants derived from combustion of fossil fuels and from subsequent photochemical reactions in the atmosphere are discussed. Among the major pollutants that adversely affect vegetation are sulfur dioxide, ozone, peroxyacyl nitrate (PAN) and analogs, nitrogen oxides, and ethylene. The chemical methods currently employed to measure the occurrence of these pollutants frequently lack specificity and sensitivity to specific pollutants. In the absence of collaborative testing, their reliability, precision, and accuracy remain uncertain. Because the plant kingdom serves as a constant atmospheric monitor, the chemical methods should be supplemented by a study of plant response. Each pollutant has its own spectrum of responding plant species and each produces a characteristic response for each species affected.

While man-made monitoring devices record exact chemical concentrations unaffected by environmental factors and pollutant mixtures, a plant responds biologically not only to concentrations, but also to all other environmental factors that alter response, i.e., humidity, soil moisture, light, temperature, etc. In addition, the plant also responds to the total impact of the pollution mixture.

H. EFFECTS — MATERIALS

00115

B. L. Ajax, C. J. Conley, and J. B. Upham

THE EFFECTS OF AIR POLLUTION ON DYED FABRICS. J. Air Pollution Control Assoc. 17,(4) 220-4, April 1967.

This report details results from the first 6 months of a 2-year study begun in February 1965 by The American Association of Textile Chemists and Colorists and the Public Health Service to evaluate the effects of air pollution upon dyed fabrics. Groups of 69 dye-fabric combinations representing widely used dyes have been exposed in light-free cabinets to ambient environments at urban and rural sites at Chicago, Washington, D.C., Tacoma, and Los Angeles, and at urban sites at Cincinnati, Phoenix, and Sarasota. Results from consecutive 3-month seasonal exposures and controlled-environment exposures utilizing irradiated and nonirradiated automobile exhaust for short duration show an extreme fading on one quarter of the dyed-fabrics, a higher fading at urban compared with rural sites on susceptible fabrics, and a marked effect upon the dyed fabrics by the photochemical by-products of automobile exhaust. (Author abstract)##

01467

J. S. Harington

CHEMICAL STUDIES OF ASBESTOS. Ann. N.Y. Acad. Sci., Vol. 132:31-47, Dec. 31, 1965. (Presented at the Biological Effects of Asbestos Conference, New York City, Oct. 19-21, 1964.)

The present paper reports the results of chemical investigations of the organic matter and metals in different types of asbestos. The primary oils which exist in natural association with crocidolite and amosite have been found to occur in larger amounts than reported earlier, although the content of benzo(a)pyrene and other polycyclic aromatic hydrocarbons remains low. Secondary oils, the composition of which is fairly well known, may contaminate asbestos in various ways. Insulation materials, recently shown to be a carcinogenic hazard to workers handling them, also contain considerable amounts of extractable materials though their significance, like that of the asbestos oils, is at present unknown. The possibility that metal constituents may play a role in asbestos carcinogenesis was suggested by the results of the spectrochemical analysis of the three main types of asbestos, and by their chemical composition. Consideration was also given to the possibility that radioactivity may play some part in the carcinogenic process.##

01983

A. P. Altshuller, A. F. Wartburg, I. R. Cohen, and S. F. Sleva

STORAGE OF VAPORS AND GASES IN PLASTIC BAGS. Intern. J. Air Water Pollution 6, 75-81, 1962.

Plastic bags of "Scotchpak" are satisfactory over 24 hr periods for storing synthetic and atmospheric samples of aliphatic hydrocarbons and acrolein, but not for storing formaldehyde, ozone, nitrogen dioxide. Plastic bags of "Mylar" are satisfactory for storing synthetic mixtures containing formaldehyde over 24 hr periods and ozone, nitrogen dioxide, and sulfur dioxide for at least several hour periods. Formaldehyde in atmospheric gases can be stored for several hours. New bags of these materials should be conditioned for several hours using the gases of vapors of interest at the same or somewhat higher concentrations than are to be used in the investigations to follow. Bags which are so treated should serve as convenient storage containers for the gases studied, as well as many other chemical species over periods of many hours. However, very appreciable losses of many of these gases may occur when present as part of combustion gas mixtures collected in such plastic containers. (Author abstract)##

02060

S. Travnicek.

EFFECTS OF AIR POLLUTION ON TEXTILES, ESPECIALLY SYNTHETIC FIBRES. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/4). pp. 229-6.

The Czechoslovak Knitting Industries Research Institute's laboratory for atmospheric defectochemistry of fibres has investigated the deterioration of fibres due to atmospheric pollutants. By analyzing witnesses' reports, by inspecting textiles damaged in the open and, above all, by operating special simulation apparatuses it has been established that apart from hot particles textiles, especially those of some synthetic fibres, can be destroyed by sulphur dioxide, especially if the latter is absorbed to solid carrier aerosols, by nitrogen oxides, by some substances contained in automotive exhaust gases, by various acid fumes, by strong oxidizers and by solvent vapours. Exhaust gases cross-link the fibre-forming polymers while, at the same time, degrading them. Light stabilizers in fibres also act as preventers of damage by exhaust fumes, to a certain degree. Dyestuffs can be efficient in a similar way. Automotive exhaust gases are sometimes more destructive if present in great dilutions in air irradiated by sunlight. In this case, a formation of strong oxidizers from residual olefins and nitrogen oxides is suspected. (Author abstract)##

02074

G. F. Bol'shakov, V. I. Davydov, T. G. Potapenko, F. Yu. Rachinskiy, and N. N. Slavacheveskaya.

INFLUENCE OF NATURAL AND SYNTHETIC SULPHUR- AND NITROGEN-CONTAINING COMPOUNDS ON THE THERMOOXIDISING STABILITY OF DIESEL DISTILLATION OF FUELS. Gostoptekhizdat (Moscow) (FTD-MT-64-215), 5, 189-92, 1963.
CFSTI; DDC AD 611071

Synthetic sulfur- and nitrogen-containing organic compounds basically lower the thermooxidizing stability of directly distilled fuels, with the exception of 2-phenyl-2-mercaptobutylamine, 1,2,3,4-tetrahydroquinoline; certain derivatives of ionol; and the product, obtained by the interaction of styrene with phenol. TS-1, T-1, and DA tars contain compounds, which, in small concentrations, are able to improve effectively the thermooxidizing stability of fuels. These are basically - heterocyclic compounds, containing thiol, amine, and phenyl groups.##

02380

J. B. Upham.

MATERIALS DETERIORATION AND AIR POLLUTION (PRESENT STATUS OF THE PUBLIC HEALTH SERVICE'S PROGRAM). J. Air Pollution Control Assoc. 15, (6) 265, June 1965. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-31.)

Four separate studies dealing primarily with atmospheric corrosion are presently in progress and constitute the first phase of an overall program to assess materials deterioration due to air pollution. The objectives of these studies and the methodology used are described, and limited preliminary data are reported. From the findings of these and subsequent studies we hope to determine the role of air pollution in the deterioration of many materials. (Author summary)##

01215

M. Kobayashi, T. Nikami, and T. Sanno.

EFFECTS OF AIR POLLUTION AND ITS PREVENTION ON INTERNATIONAL TELECOMMUNICATION SYSTEMS. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 3, (6) 45-51, Mar. 1966.

The effects of inorganic gases, organic gases, and soot on pure palladium are investigated. Palladium is used at the contacts in crossbar switches and wire spring relays and pollutants cause poor electrical connection.##

015291

G. Miller

OZONE RESISTANCE BARRIER MATERIAL. Army Tank-Automotive Center, Warren, Mich. (Rept. 4811.) Mar. 20, 1968. 6 pp.
DDC: AD 677 560

In order to establish the efficacy of plastic barrier material in delaying ozone deterioration on rubber items, static 01 tests

(50 plus or - 5 pphm O3 by vol) were carried out at temperatures of 100 F on rubber test specimens wrapped in the following plastic materials: black polyethylene sheet film, 2 and 4 mils thick; transparent saran sheet film, 2 mils thick; commercial transparent plastic shirt bag, 1 mil in film thickness; black polyethylene bag film, 2 mils thick, formed by folding and sewing 3 sides; and transparent polyethylene envelope, heat sealed on 3 sides, film thickness of 6 mils. Rubber specimens were reported in satisfactory condition after 20, 40, 25, 40, 22, and 250 days' exposure, protected respectively, by the above named materials. Doubling the black polyethylene film doubles the time before deterioration takes place; also the better the seal, the longer it takes before ozone deterioration commences.##

03995

HOW TO PROTECT ELASTOMER PARTS FROM OZONE ATTACK. Mater. Design Eng. 54, (2) 82-3, Aug. 1966.

Susceptibility of an elastomer to ozone deterioration is related to its proportion of unsaturated carbon-to-carbon bonds. As O3 attacks these bonds, elastomers with a large proportion of them are very vulnerable. Commercial elastomers can be divided into 3 groups according to their O3 resistance: Group A (inherently O3-resistant) includes fluoroelastomers, silicone rubber, fluorinated silicone rubber, polyacrylate, chlorosulfonated polyethylene, ethylene-propylene copolymers and terpolymers, polyurethanes, polysulfide rubber, epichlorohydrin elastomers; Group B (O3-resistant but requiring special formulation for optimum performance) includes butyl and halogenated butyl rubbers; Group C (inherently non-O3-resistant) includes natural rubber, polyisoprene rubber, SBR, NBR, polybutadiene rubber. Hydrocarbon waxes and lacquers have been used in the past for protection but have the disadvantage of rupturing when flexed, leaving the vulnerable elastomer exposed. A new class of chemical derivatives, P-phenylenediamines have been found to be effective against O3 attack. These additives are added to the rubber during mixing, bloom to the surface during vulcanization and form a film which reacts with the atmospheric O3 before it comes into contact with the elastomer. When an elastomer will be exposed to substances which may dissolve the protective films, blending of highly resistant O3 materials is the best approach.##

04350

Jaffe, L. S.

THE EFFECTS OF PHOTOCHEMICAL OXIDANTS ON MATERIALS. J. Air Pollution Control Assoc. 17(6):375-378, June 1967.

The deterioration of materials exposed to photochemical smog, in particular to the oxidants and ozone contained therein, are reviewed. One of the earliest indications of photochemical oxidants was the excessive cracking of rubber products. It has been demonstrated that this excessive cracking of rubber is caused by ozone formed in the photochemical smog formation process. Other materials known to deteriorate under atmospheric photochemical smog conditions are textiles and certain dyed

fabrics, particularly under conditions of high humidity. Loss of tensile strength of cotton textiles when wet or moist, and similar fading of these dyed fabrics, particularly under high humidity, can be produced by laboratory exposure of these textiles to pure ozone. Depending on the formulation of the rubber, cracking under stress can be readily detected within 1/4 hr when atmospheric oxidants levels are as low as 0.01 ppm. Natural and certain synthetic rubbers are particularly vulnerable. These rubbers when stressed show cracking when exposed to 0.02 ppm ozone for about 1 hr. Ozone effects on asphaltic materials are reported also. &&&&

05243

F. J. Heuvel

VOLATILE PHOTODEGRADATION PRODUCTS OF ORGANIC COATINGS. Naval Civil Engineering Lab., Port Hueneme, Calif. July 1966. 36 pp. (Technical Rept. (No. R 460.)

Various clear and pigmented vehicle films were irradiated in air with a mercury arc and a xenon arc. The volatile photodegradation products were identified by infrared spectroscopy. The coatings included alkyd, oil, vinyl-alkyd, vinyl copolymer, partially hydrolyzed vinyl copolymer, polyvinyl acetate, epoxy-amine, and epoxy-polyamide films. The major product from all films was carbon dioxide. Eleven other products or types of products were obtained, as well as some unidentified products. The addition of pigments decreased the yields of almost all the products. However, the yields of different products were affected in different degrees by pigmentation, and this difference may in part be related to the penetration of the light responsible for the production of each particular product. (Author abstract)

05279

Weber, A.

ATMOSPHERIC POLLUTION AS A FACTOR IN THE AGING OF ELASTOMERS. ((La pollution atmospherique cause facteur de vieillissement d'elastomere.)) Text in French. Rev. Pathol. Comparee (Paris), 67(764):21-29, Jan. 1967. 2 refs.

A technique for the evaluation of aging of natural rubber films is described. Aging is determined either by loss of resistance to breaking, expressed in gm./sq. cm. section, or by variation in the modulus of elasticity. The mathematical calculation of resistance to rupture correlates with the observed results. A series of rubber films formulated with the following agents were tested: (1) with the bridge catalyst, phenylethyldithiocarbamate; (2) with the catalyst and an antioxygenating agent, bis-(2-hydroxy-3-butyl-5-methylphenyl) methane; (3) with the catalyst and titanium dioxide; (4) with the catalyst and isopropyl N-phenyl-P-phenylene diamine; and, (5) with all four agents. Samples of the first three rubber formulations, when exposed to polluted air, exhibited marked decreases in tensile strength with age (25.5-65.2% decrease). Only the samples formulated with the diamine or with all four agents exhibited no significant decrease in tensile strength (1.5% increase, and 0.2% decrease, respectively).&&

15657

Fink, Ferdinand

THE COMBUSTION OF DOMESTIC REFUSE CONTAINING A HIGH PROPORTION OF SYNTHETIC MATERIALS. (Verbrennung von Hausmuell mit hohenem Kunststoffanteilen). Text in German. Brennstoff-Waerme-Kraft, 21(9):473-476, Sept. 1969. 8 refs.

The domestic refuse in the city of Zurich contained 1.1 to 2.7% by weight of synthetic material in the years 1963 and 1968, as compared with other large cities where it contained 4 to 9%. In Germany, half of the synthetics in domestic refuse are composed of polyvinyl chloride (PVC). The relatively low PVC fraction in the waste causes corrosion problems. Polyvinyl chloride begins to melt at 120 C; at 200 C, it begins to separate. It has a heating value of 6000 kcal/kg; the ignition point is 460 C. Domestic refuse is incinerated with a large amount of excess air. The heterogeneous waste composition causes a fluctuating combustion process. Thus, the waste gas composition varies as follows: 7 to 11% by volume CO, 10 to 16% water vapor, 6 to 10% oxygen, and 0.2 to 1.0 g/cu m HCl. Varying gas composition and fluctuating temperatures damage the oxide layer on the steel pipes. There are two types of corrosion: sulfate corrosion and chlorine corrosion. It is generally thought that sulfate corrosion is due to alkali pyrosulfates which, when superheated, yield activated SO3. The latter substance is highly corrosive. Chlorine corrosion is due to the presence of HCl. In oxidizing waste gases, HCl attacks only metal; in reducing waste gases, iron oxide and dust incrustations may absorb HCl, which is liberated again at higher temperatures. The chlorine gas and the HCl which develop in this manner are both highly corrosive after desorption. To prevent chlorine corrosion, large amounts of water vapor must be present in the waste gas. Injection of water into the combustion chamber helps to fulfill this demand. Furthermore, reducing components in the waste gas must be avoided. The temperature at the pipe wall should never exceed 500 C.

I. EFFECTS — ECONOMIC

01289

R. J. Sterba.

REFINING TO PRODUCE GASOLINES OF REDUCED LEAD CONTENT. Universal Oil Products Co., Des Plaines, Ill. (Presented at the Symposium on Environmental Lead Contamination, Public Health Service, Washington, D.C., Dec. 13-15, 1965.) Mar. 1966. pp. 111-30.
GPO 0-210-345; NEW 1440

In the variations of the generalized situations considered in this discussion, the estimated incremental manufacturing cost to the refiner for making an unleaded gasoline of current octane number quality ranged from 1.1 to 1.5 cents/gal. above what it costs to make current gasolines. This incremental cost will vary, both above and below the range indicated, depending on the refinery size, its type, its location, crude characteristics, crude supply situation, products made, price structures, labor costs, accounting methods, and many other factors. The important conclusion to be made is that it is possible to make unleaded gasolines, but at costs that must be passed on to the driving public. In order to market the same amount and quality of clear gasoline as the refiner presently sells of leaded gasoline, he must either market less of distillates or residual fuel, or process more crude oil. Based on estimates made for a 50,000 bbd refinery, the U.S. refining industry would be required to make a capital investment of 1.5 to 2 billion dollars. This is to be compared with annual expenditures of the order of 900 million dollars for normal refinery expansion and modernization.##

07898

Lipton, Linda

AIR AND WATER POLLUTION: DOES IT LIMIT INDUSTRIAL EXPANSION? Ind. Develop., 15(5):14-21, July-Aug. 1967.

The cost of cleaning the nation's air and water is discussed, with particular emphasis on the role of industry. The Public Health Service estimated that the cost of air pollution in 1960 was $7 billion. They estimated that it is now costing about $11.5 billion and it may increase to $20 billion by 1975 for abatement equipment, extra cost of cleaner fuel, and damage to crops, buildings and other property. The need to deal with the increasing amounts of air and water pollution affects plant operations and

11268

Lawson, H. W., J. F. Moore, and J. B. Bather, Jr.

A LOOK AT LEAD ECONOMICS IN NO/OP GASOLINE. Preprint, Phillips Petroleum Co., Bartlesville, Okla., Conner and Moore Associates, Inc., Houston, Texas, and Mobil Oil Corp., New York, 15p. 1967. 7 refs. (Presented at 32nd Midyear Meeting of Refining, Fuels and Emissions, Los Angeles, Calif., May 16, 1967, Paper 36-67.)

The potential economic effects on the domestic refining industry that would result from completely eliminating the use of lead additives in motor gasoline were investigated. A complete technical and economic report containing results as well as a compilation of data is presented.**

16174

COSTS AND ECONOMIC IMPACTS OF AIR POLLUTION CONTROL FISCAL YEARS 1970-1976. Ernst and Ernst, Washington, D. C. Contract PH 22-68-29, Task Order 2, 331p., Oct. 1969. 26 refs.

A study was conducted to estimate prospective additional costs to the private sector of the economy of controlling air pollution from both stationary and mobile sources during the years 1970-1976. The pollutants considered are particulate and sulfur oxides from stationary sources and hydrocarbons and carbon monoxide from automobiles. Estimates of control conditions prevailing prior to the passage of the Air Quality Act (1967) were taken as a base. Two types of stationary sources are considered: combustion and process. Costs are estimated for controlling three classes of combustion sources: steam-electric power generation, industrial fuel combustion, commercial fuel combustion. Industries for which process emission control costs are developed are sulfate pulping, sulfuric acid manufacture, petroleum refining, asphalt batching, hydraulic cement production, steel production, ferrous casting, and nonferrous metals smelting and refining. Only automobiles are included in the mobile source class. Estimates of additional costs to the private sector are developed for nationwide control of sulfur oxides and particulates from stationary combustion sources; nationwide control of particulate from process sources in eight selected industries and of sulfur oxides from sulfuric acid and petroleum refining process; nationwide control of automobile exhaust emissions; and combined control of sulfur oxides and particulates from combustion and process sources in 65 geographical areas. Estimated costs are presented as ranges within which actual costs can be expected to fall. The economic implications of control costs for the nation are discussed. The additional costs range from $0.9 to $1.7 billion dollars for 1970 and rise to $1.6 to $1.9 billion in 1976. (Author summary modified)

16617

Francis, A. W. and Judson D. Lund

HOW TO INCREASE LIQUID RECOVERY FROM YOUR GAS-CONDENSATE OIL WELLS. Gas J., 57(51):88-95, Dec. 14, 1959.

High-efficiency liquid recovery methods, economically justified, are used on wet gas streams. Evaluation of the wellhead or lease-type processes covers: stage separation, liquid processing (stabilization), adsorption recovery from high-pressure separator gas, or combinations of these. Three divergent but typical gas-distillate well streams classified as lean, rich, and very rich are considered. The factors evaluated for each process on each stream are: liquid recovery efficiency, optimum separation conditions, gross operating income generated by increased recovery efficiency, differential expenses associated with increased recovery efficiency, the pattern for payback of increased investment, and the rate of return on the increased investment.

J. AIR QUALITY MEASUREMENTS

00110

R. I. Larsen

DETERMINING SOURCE REDUCTION NEEDED TO MEET AIR QUALITY STANDARDS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/B.) pp. 60-6.

Air pollutant concentrations can be expressed as a function of location, averaging time, and frequency that a certain concentration is exceeded. Concentration data can be used with air quality standards to calculate the overall source reduction needed to meet a standard. The calculations can be refined to consider the effects of future growth, rural background concentrations, secondary pollutants arising from photochemical and other atmospheric interactions, and the contribution from each source or source type in a city. (Author)##

00111

E. Sawicki, H. Johnson and R. Morgan

COMPARISON OF FLUORIMETRIC METHODS OF ASSAY FOR 7H-DIBENZ(DE)ANTHRACEN-7-ONE IN AIRBORNE PARTICULATES AND AIR POLLUTION SOURCE EFFLUENTS. Microchim. Acta (2) 307-316 1966.

Various modifications of a thin-layer chromatography fluorimetric method for the determination of 7H-benz(de)anthracen-7-one (BO) and phenalen-1-one (PO) in complex mixtures have been compared. The best modifications consisted of one-dimensional thin-layer chromatography followed by elution, solution in trifluoroacetic acid, followed by either spectrophotofluorimetric of fluorimetric assay. In some cases a quenching agent was necessary to quench the fluorescence of the interferences. Urban atmospheres and air pollution source effluents can be analyzed by these micromethods. These methods with slight modification could be applied to the determination of the azo heterocyclic and the other ring-carbonyl compounds found in urban atmospheres and air pollution source effluents. (Author)##

00241

R.W. Hum D.B. Smisinger

AIR POLLUTION INVENTORY - WATER VAPOR EMISSIONS. Proc. Am. Petrol. Inst., 45(III):127-132, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Div. of Refining, Montreal, Canada, May 10, 1965.)

Exhaust gases from truck-type diesel engines tested on a dynamometer stand were shown to involve hydrocarbons, oxides of nitrogen, and formaldehyde in significant quantities. Without reference to similar modes of operation, each class of pollutant was found to be generated in the diesel combustion in concentrations comparable to concentrations found in automotive (gasoline-powered) equipment. Although some trends in the data were observed, the experimental program was not extensive enough to justify conclusions regarding effects of fuels, engine design, or mode of engine operation. In comparing present findings with previously published information, the authors have noted interpretations of data that do not readily reflect the significant magnitudes of diesel emissions. Both the real contribution of diesels to air pollutant loading and the participation of these pollutants in the photochemical system should be weighed more carefully. (authors' abstract)##

00251

L. H. Rockner, W. E. Scott and W. F. Miller

THE COMPOSITION AND ODOR OF DIESEL EXHAUST. Proc. Am. Petrol. Inst. 45(III):133-147, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Division of Refining, Montreal, Canada, May 10, 1965.)

Sampling and analysis techniques are described for determining light hydrocarbons, oxides of nitrogen, formaldehyde, acrolein, total aldehydes, total particulate, and polycyclic aromatic hydrocarbons in diesel exhaust. Using the techniques described, results are reported on the composition of exhaust from two diesel engines, a two- and a four-cycle, under a variety of operating conditions. Smoke ratings using different techniques are also reported and compared to total particulate results. No correlation was found between smokemeter ratings and particulate loadings at other than black smoke conditions. Human panel observations of exhaust odor are being made as part of a continuing program, but no panel data are reported. (authors' abstract)##

00447

W. H. Tolleson, Sr. and H. L. Morris

CHEMICAL ANALYSIS OF PERMANENT AND ORGANIC GASES IN A 30-DAY MANNED EXPERIMENT. Aerospace Med. 37(5):533-538, May 1966.

Chemical analyses of the permanent gases and the trace volatile organic constituents were performed on a 30-day manned experiment. This experiment was primarily concerned with the feasibility of providing a suitable atmosphere for three men. The major portion of the oxygen required by the subjects was obtained from their exhaled carbon dioxide by means of the Sabatier process. The primary instrumentation used was the gas chromatograph. The adjunct instrumentation was infrared spectrophotometry and mass spectrometry. Consideration is given to the sampling and analytical procedures used. Organic compounds unique to space cabin and evaluator studies are reported. Indications of future gas chromatography methodology are given.##

00538

C. B. Robinson, F. L. Meadows, and J. J. Henderson

AIR POLLUTION PATTERNS IN THE GREATER BIRMINGHAM AREA. Preprint. 1965.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings with air quality data. This paper describes part of the aerometric effort begun in December 1963 in the Greater Birmingham Area. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hour gases (nitrogen dioxide, sulfur dioxide, and aldehyde) were collected routinely from 21 stations located primarily in residential areas. The sampling network, analytical methods, and statistical procedures used are discussed. Air quality results are presented with emphasis on spatial and temporal variations. (Authors' abstract)**

00321

R. J. Larsen, C. E. Singer, D. A. Lynn, H. G. Bissel

ANALYZING AIR POLLUTANT CONCENTRATION AND DOSAGE DATA. J. Air Pollution Control Assoc. 17, (2) 85-91, Feb. 1967. (Presented at the 59th Annual Meeting of the Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-93.)

Continuous air pollutant concentration data have been analyzed for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur. San Francisco, and Washington for years 1962 through 1964. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. Air pollutant dosage (concentration times time) above various threshold concentrations has been computed for all of the pollutants in all of the cities for year 1964. Equations have been developed from these analyses to predict the frequency of occurrence of air pollutant dosages of various intensities as a function of the geometric mean and standard geometric deviation. An example is shown for predicting the number of occurrences of sulfur dioxide dosages that might cause acute plant damage. (Author)**

00526

Middleton, J. T.

CONTROL OF ENVIRONMENT - ECONOMIC AND TECHNOLOGICAL PROSPECTS. Preprint, In: Environ. Improvement: Air, Water, Soil, pp. 53-71, Oct. 1966. (Presented at the Dept. of Agriculture on or about May 24, 1966)

Man's exploitation of land, water, and air has caused serious pollution of his environment, not only affecting man but other

00635

E. Sawicki, J. E. Meeker, and M. J. Morgan

THE QUANTITATIVE COMPOSITION OF AIR POLLUTION SOURCE EFFLUENTS IN TERMS OF AZA HETEROCYCLIC COMPOUNDS AND POLYNUCLEAR AROMATIC HYDROCARBONS. Intern. J. Air Water Pollution 9, 291-8, 1965.

Eleven heterocyclic compounds and twelve polynuclear aromatic hydrocarbons have been determined in the effluents from the stack of a coal-heated residence, in effluents from two industrial sources and in air contaminated with coal-tar-pitch fumes. These compounds were present in extremely large amounts. In addition to the hydrocarbon carcinogens, such as benzo(a)pyrene and benzo(a)anthracene, some aza heterocyclic carcinogens were found, e.g., dibenz(a,h)acridine, dibenz(a,j)acridine, and some possibly carcinogenic alkylbenz(c)acridines. A large number of the other aza heterocyclic compounds were present but were not determined because of the unavailability of standards. (Author abstract)##

00682

M. Ingram, J. H. McCarroll, E. J. Cassell, and D. Walter

HEALTH AND THE URBAN ENVIRONMENT (AIR POLLUTION AND FAMILY ILLNESS): II. TWO ACUTE AIR POLLUTION EPISODES IN NEW YORK CITY). Arch. Environ. Health Vol. 10(2):264-266, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Article briefly describes two air pollution episodes in New York County, October 10-27, 1963 and November 8-December 5, 1963. The factors of meteorological conditions (and stabilities) are considered in the study; also relative concentrations of SO2 and hydrocarbon content.##

00689

H. E. Moore, W. B. Drevley, and H. Bate

POLYNUCLEAR AROMATIC HYDROCARBONS IN URBAN ATMOSPHERES IN ONTARIO. J. Air Pollution Control Assoc. Vol. 16(9):492-497, Sept. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-116.)

In Canada a considerable number of polynuclear aromatic hydrocarbons has been extracted from particulate samples collected from the atmospheres of Windsor, Ottawa, Montreal and Vancouver, and the presence of 3,4-benzpyrene has been confirmed qualitatively, and, in a few cases, quantitatively but the samples have been collected somewhat at random and primarily for the purpose of developing analytical methods. This paper describes the results of a comprehensive sampling programme and the concentrations of a number of polynuclear aromatics found in the atmospheres of over 20 Ontario cities and towns.##

living organisms, quality of the land, water, and air resources. Not only must large sums of money be spent to restore the quality of man's environment, but it must be done quickly. The quality of air is determined by the mass made of air and by the pollutants injected into it by man. While most air contamination results from pesticides and chemical manufacturing the greatest degradation results from the use of air to support combustion. Principal pollutants from combustion for the development of energy and the propulsion of motor vehicles, and the manufacture of goods are liquid and solid particles, oxides of S and N, organic vapors, CO2 and CO. The pollutant released in largest quantities throughout the nation is SO2, amounting to 31,300,000 tons a year. The quality of air within a given air mass depends upon the nature of pollutants, the quality of the air supply and the geographical and meteorological factors affecting the movement and dispersal of contaminants. A result of multiple pollution sources is the combination of N oxides and organic vapors in the presence of sunlight, resulting in photochemical air pollution i.e. ozone, peroxyacetyl nitrate (PAN), aldehydes, and organic acids. The resulting pollution effects are metal corrosion, building and fabric deterioration, cracking of rubber, visibility reduction, forest and agriculture damages, livestock injury health problems, and the spoiling of air environment. The recognized importance of these effects, the recognition of air pollution as a social problem, and the enactment of legislation to control air quality has occurred at both state and national levels.##

00727

L. DeMaio H. Corn

POLYNUCLEAR AROMATIC HYDROCARBONS ASSOCIATED WITH PARTICULATES IN PITTSBURGH AIR. J. Air Pollution Control Assoc., 16(2):67-71, Feb. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-37.)

A sampling method which separately collected "respirable" and "non-respirable" particulates was used in conjunction with a new method of analysis to study the aromatic polynuclear hydrocarbon content of suspended particulates in the air of Pittsburgh during summer and winter months. Gas chromatography was successfully used for the first time to analyze airborne particulates for polycyclic hydrocarbon content. After benzene extraction of a particulate sample the time required, benz(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and benzo(e)pyrene in respirable and non-respirable sample fractions are presented in terms of micrograms/1000 cubic meter of air, micrograms/g suspended particulate, and micrograms/g benzene soluble fraction. More than three-fourths by weight of the hydrocarbons studied were associated with respirable particulates, i.e., material collected on the filter stage of the sampling apparatus. Concentrations of all polycyclics except pyrene and benz(a)anthracene were greater in winter than in summer. The concentration of the highly carcinogenic benzo(a)pyrene was found to vary from 0.8 micrograms to 37.4 micrograms/1000 cubic meter. Approximately 60% of the 24 urban sites sampled in 1960 by Saltzman were characterized by values below this average. In general, the profile of concentrations of the polynuclear aromatic hydrocarbons studied, with the exception of benz(a)anthracene, was quantitatively similar to those

reported by Savitch for other American cities. Benz(a)anthracene was found to be present in Pittsburgh air at a concentration exceeding that of any other compound studied. Concentrations of benz(a)anthracene in other American cities are not reported in the literature and this new result awaits confirmation by analysts elsewhere. Presumably, lack of interest in this [illegible] owed stems from its lower capacity for carcinogenesis relativ[illegible] benzo(a)pyrene. (Author's summary)##

00730

B.H. Eigenfritz, J.F. Shively, H.E. Orlemann

SURVEYING AIR QUALITY AT DOW CHEMICAL COMPANY (AIR POLLUTION CONTROL EQUIPMENT EXPLAIN). Air Eng., 7(10):30-38, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

An 18-station survey program was established in 1950 for Midland, Michigan, headquarters of the Dow Chemical Company and location of the Midland Division. This site contains a chemical complex with over 500 organic and inorganic chemical processes. Measurements of dustfall sulfation, sulfur dioxide, suspended dust, stain index, chlorides, hydrocarbons and corrosion are recorded and correlated with meteorological data. Air Pollution complaint data are also recorded both within the plant and in the community and form a part of this surveillance program. (Author's abstract)##

00739

C.E. Singer P.I. Larsen

CALCULATING AIR QUALITY AND ITS CONTROL. J. Air Pollution Control Assoc., 15(10):465-472, Dec. 1965. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

Air quality is shown as a function of averaging times of five minutes to one year for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur dioxide in Chicago, Cincinnati, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D. C. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. The exponent is a function of the standard geometric deviation. General air quality and control parameters are derived and shown for one example, nitrogen oxides in Washington, D. C. These values are compared to one air quality standard. (Authors' abstract)##

00883

I.R. Williams

AN ATMOSPHERIC SURVEY OF CHILLIWACK, BRITISH COLUMBIA. Preprint. 1963.

A one-year study of the air pollution level of the City of Chillicothe has been completed. Methods employed and data collected for dustfall, sulfation rates, soiling index, hydrogen sulfide, oxidants and total hydrocarbons are presented. Difficulties experienced in the determination of very low oxidant levels are discussed. The results obtained indicate that the City is particularly free of air pollutants and thus will serve as a suitable base for comparative studies on the relationship between air pollution and other factors in the prevalence of certain chronic respiratory diseases. (Author abstract)##

00667

J.D. Williams H.G. Edmiston

AN AIR RESOURCE MANAGEMENT PLAN FOR THE NASHVILLE METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Sept. 1965. 160 pp.
GPO: 822-811-8; HSM: 999 AP - 18

This report is based on the numerous technical and scientific papers resulting from a joint study of air pollution and effects made in Nashville, Tennessee, by the Public Health Service, Vanderbilt University, and state and local agencies during 1958-59. These papers have been supplemented by field investigations to complete the background information needed for preparation of an air resource management program plan. The report summarizes a number of the technical and scientific papers and uses all of them to develop new concepts as well as unify new and old approaches to air pollution control in preparation of the air resource management program plan. Air quality goals and the means to reach those goals are suggested. Supporting data are provided and methodology adapted for relating air quality goals to control of emissions. Methods for predicting air pollutant levels by use of mathematical models are presented. Public opinion survey results and their implications for the air resource management program are given. The report has specific use for development of an air resource management program in Nashville and general use for program development and reference in many other places. (Author abstract)##

01018

A REPORT TO THE LEGISLATURE ON AIR POLLUTION IN COLORADO. Colorado State Dept. of Public Health, Denver. Feb. 5, 1968. 66 pp.

A series of studies by the State Department of Public Health, local health departments and other interested agencies and groups led to the present Colorado Air Pollution Law calling for the State Department of Public Health to study the air pollution problem and to recommend ambient air standards and control measures. Colorado is experiencing a rapid growth of population, urbanization and sources of air pollution, and meteorological and topographical features over much of the state are conducive to the development of serious air pollution conditions. With the assistance of the Colorado Air Pollution Advisory Committee, the State Dept. of Public Health has recommended standards for ambient air quality in the state. Air quality monitoring programs in six of Colorado's largest cities

were conducted and such information about the extent and nature of the air pollution problem was obtained. Three monitored areas (Denver Metropolitan Area, Boulder and Pueblo) definitely do not meet the ambient air quality standards established and one (Grand Junction) might not meet the standards. The geographical air pollution basins of the areas that do not meet the standards have been outlined, with the exception of Boulder. The geographical boundaries for Boulder will be determined at an early date. Measures for the abatement of air pollution within the state have been recommended and are listed. (Author summary)##

01089

V. J. Konopinski and L. J. Schafer

ORGANIC LEAD - CINCINNATI 1965. Preprint. 1966.

The U.S. Public Health Service and Battelle Laboratory cooperated in making this study to obtain additional data on the concentration of alkyl lead compounds in the atmosphere by varying the sample air volumes. Two different locations in Cincinnati were used to obtain ambient air samples. Particulate lead was removed from the air by millipore filters while scrubbers filled with iodine crystals served to separate out the organic lead compounds. Analysis for organic lead was by wet-chemistry techniques. Results corroborated the findings of Cholak and associates that organic lead compounds are present in the air in very small concentrations.##

01202

R. Nolan

A SURVEY OF AIR POLLUTION IN COMMUNITIES AROUND THE JOHN F. KENNEDY INTERNATIONAL AIRPORT (Sept. - Oct. 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. June 1966. 82 pp.
APO,HSM: 926-79?-2

A 1-month air-quality study was conducted in the communities adjacent to John F. Kennedy Airport in Queens and Nassau Counties, New York, from September 29 to October 28, 1964. Eight sampling stations were located in the area. Limited measurements of particulate matter and hydrocarbons, and odor observations yielded some evidence to indicate that aircraft operations contributed a small amount to particulate and hydrocarbon concentrations and to odor occurrence. Concentrations of particulates, odors, and hydrocarbons at the sampling stations were substantial and came from many sources in the metropolitan area. Thus, the small variations that occurred in measured air quality were not significantly correlated to aircraft emissions on a statistical basis. The number and percentage of jet aircraft using water injection during takeoff decreased markedly from 1963 to 1964 at the J. F. Kennedy Airport; therefore, smoke emissions caused by water injection have been reduced. This downward trend is expected to continue. Meteorological conditions during the study were near normal for this period of the year. Poor conditions for atmospheric dispersion were experienced for a

5-day period; however, no prolonged severe atmospheric stagnation occurred. Therefore, air contaminant concentrations that would exist under extremely adverse meteorological conditions could not be measured. The limited, modest studies did not show any difference in the characteristics of particulates emitted from jet, diesel, or gasoline engines.##

01270

R. Reis

QUALITY STANDARDS FOR AIR AND WATER. Occupational Health Rev. (Ottawa) 17(1):3-8, 1965. (Presented at the Occupational Health and Safety Conference, Canadian Congress of Labour, North Bay, Ontario, Nov. 10, 1964).

Author reiterates air quality standards and threshold limit values for gases and vapors (ppm) in the USSR and USA; ambient air quality standards and workroom air threshold limit values for some gases (carbon monoxide, chlorine, hydrogen chloride, ethylene, ozone, oxides of nitrogen and sulfur dioxide); air quality standards and threshold limit values for solids or liquids; and comparative ambient air quality standards for particulate matter. Data are given for California, Oregon, USSR, Czechoslovakia and West Germany.##

01271

S. P. McPherson, E. Sawicki, and F. T. Fox

CHARACTERIZATION AND ESTIMATION OF N-ALKANES IN AIRBORNE PARTICULATES. J. Gas Chromatog., Vol. 4:158-159, April 1966.

A system is presented for the characterization and analysis of atmospheric n-alkanes, C15 to C28. Several atmospheric samples obtained from Nashville have been analyzed for these compounds. Their importance is derived from their reported cocarcinogenicity. (Author Abstract)##

01736

A. P. Altshuller, T. A. Cohen, C. A. Clemons, and E. Vandersanden

METHANE COMPOSITION OF URBAN ATMOSPHERES. Intern. J. Air Water Pollution 8, 39-45, 1964.

Methane levels have been determined in Los Angeles, Cincinnati, Chicago, and Washington, D.C., by analysis with flame ionization gas-solid chromatography. Samples were analyzed directly from the atmosphere and after collection in a variety of flexible containers. Most of the concentrations of methane measured in urban atmospheres are in the range between 1.5 and 2.5 ppm. However, values ranging from slightly below 1.2 ppm to 6 ppm are observed. The geophysical methane level appears to be in the 1.0 to 1.2 ppm range. (Author Abstract)##

01830

B. A. Brion and J. H. Ludwig

THE DISTRIBUTION OF VEHICULAR AIR POLLUTION IN THE UNITED STATES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-21.)

The contribution of automotive vehicular emissions to air pollution and the magnitude of the effects of these emissions have been well documented in Los Angeles County and to a lesser extent throughout the State of California. Data are presented which show the presence of photochemical "smog" and prevalence of "smog" in eastern communities is not as high as in Los Angeles; however, evidence from most large cities where atmospheric pollutants have been measured shows some photochemical activity with production of oxidants throughout the year and severe "smog" when adverse meteorological conditions occur. Plant damage of the types associated with photochemical pollutants has been observed in many areas throughout the country and further indicates the presence of adverse levels of motor-vehicle-derived pollutants. Source surveys in a number of cities in the United States show that motor vehicles are responsible for very appreciable amounts of the total emissions of hydrocarbons, nitrogen oxides, and carbon monoxide. The facts presented clearly point to potential problems under current conditions and problems of increasing severity as population densities and use of motor vehicles increase. (Author abstract) 55

01912

D. A. Lynn and T. B. McMullen.

AIR POLLUTION IN SIX MAJOR U.S. CITIES AS MEASURED BY THE CONTINUOUS AIR MONITORING PROGRAM (CAMP). J. Air Pollution Control Assoc. 16, (4) 186-90, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-93.)

Data obtained by the Continuous Air Monitoring Program (CAMP) in six cities during 2 years are summarized. Six gaseous pollutants were monitored in Cincinnati, Chicago, New Orleans, Philadelphia, San Francisco, and Washington, D.C. during 1962 and 1963. The data serve as a basis for describing several contrasts and similarities in the nature of air pollution experienced in six cities, which represent a broad geographical and climatological range of urban environments. Specific topics covered are: typical pollutant levels, patterns of daily and seasonal variations, and unusual phenomena such as atmospheric stagnation periods and photochemical smog formation. (Author abstract) 55

01949

P. W. Hildebrand and R. L. Stockman

AIR QUALITY IN CLARK COUNTY, WASHINGTON. Washington State Dept. of Health, Olympia, Division of Environmental Health. 75 pp.

This is a report on a community air pollution survey which began Feb. 1, 1961 and which was conducted in cooperation with the Clark County Air Pollution Committee and the Clark-Skamania Health District. The following findings, and conclusions, are given. Clark County air pollution problems are primarily restricted to localized areas in the immediate vicinity of specific sources. Existing nuisance conditions and the potential for an area-wide problem in the near future warrant corrective and preventive action on the part of the community. Air pollution concentrations in Portland, Oregon are demonstrably higher than those measured in Clark County leading to the conclusion that area-wide pollution in the County will increase as community development progresses. Air pollution effects that can be established include fallout of solid materials, odor, soiling, and aesthetic considerations. Heating and transportation make significant contributions to the total problem. Gaseous emissions and concentrations have not been studied sufficiently to establish their effects upon the community. Local legislation is presently inadequate to control the problem on either a corrective or preventive basis. This report recommends that an air pollution control district, as provided for by the laws of the state of Washington, be established encompassing Clark County and the cities of Vancouver and Camas.[3]

01980

A. P. Altshuller and F. A. Cohen

GAS CHROMATOGRAPHIC ANALYSIS OF HYDROCARBONS IN THE LOS ANGELES ATMOSPHERE. J. Air Pollution Control Assoc. 13, (2) 81-7, Feb. 1963. [Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.]

Almost 900 gas chromatographic analyses for hydrocarbons were made on 1 ml gas samples collected directly from the atmosphere outside the monitoring station at the San Pedro street laboratory. Analyses were made on a molecular sieve column for methane; on a silica gel column for ethane, ethylene, acetylene, propane, propylene, n-butane, isobutane, n-pentane, and isopentane; or on a carbowax column for benzene, toluene, ethylbenzene, and m, p-, and o-xylene. A concentration range for 0.005 to 4 ppm was covered for the various hydrocarbons in these analyses. The gas chromatograph was operated as a monitoring instrument with samples manually injected for analysis every 15 to 30 minutes. It was demonstrated that rapid repetitive analyses of small-volume samples taken directly from polluted atmospheres are possible with gas chromatographs equipped with flame ionization detectors. A wide variety of hydrocarbons can be analyzed. It appears that monitoring gas chromatographs should be entirely feasible for atmospheric hydrocarbon analyses. Data now available indicate that only a small part of the hydrocarbons present in the atmosphere are highly reactive in producing smog manifestations. The fraction of hydrocarbons present that are moderately to slight reactive is several times greater than the highly reactive fraction; a majority of the hydrocarbons present in the atmosphere are essentially inert in smog-producing reactions. This wide variation in the reactivity of hydrocarbon species makes it very difficult to interpret results from infrared or flame ionization hydrocarbon analyzers for total atmospheric hydrocarbons or organics. Both instruments, and especially the infrared one, give

the paraffinic hydrocarbons much more weight than is warranted by their reactivities. This intrinsic disadvantage will prevail until more specific monitoring instruments are developed for the various hydrocarbon series.##

01981

A. P. Altshuller and I. Cohen

THE GAS PHASE REACTIONS OF NITROGEN OXIDES WITH OLEFINS.
Intern. J. Air Water Pollution 6, (1/2) 55-69, 1961.
(Presented at the Tenth Annual Meeting, American Chemical Society, Chicago, Ill., Sept. 1958)

The nature of the condensation products formed in the gas phase reactions of nitrogen dioxide and nitric oxide with pentene-1, 2-methylbutene-2, and 2-methylbutadiene-1,3 was investigated. The reactants were combined at partial pressures in the range of 0.1 to 2.5 mm with the total pressure at one atmosphere. The products were determined by infrared and ultraviolet spectroscopy and colorimetry. The condensates included primary and secondary nitro compounds and alkyl nitrates. Strong hydroxyl and single bond carbon to oxygen stretching vibrations indicate the presence of either nitroalcohols or simple aliphatic alcohols formed through oxidation reactions. Carbonyl stretching frequencies observable in some of the reactions support the conclusion that a portion of the reactants disappear by oxidation rather than by nitration processes. The available results do not indicate the presence of appreciable amounts of tert.-nitrocompounds, conjugated nitro-olefins, or gem-dinitroalkanes. The reactivities of the olefins with the nitrogen oxides are in the decreasing order: 2-methylbutadiene-1,3, 2-methylbutene-2, pentene-1. (Author abstract)##

02061

M. Watanabe and M. Tsuita.

CARCINOGENIC HYDROCARBONS IN THE ATMOSPHERE OF OSAKA CITY.
Proc. (Part 1) Intern. Clean Air Cong., London, 1960.
(Paper VIII/5), pp. 236-8.

During the two-year period from September 1957 to August 1959 local and seasonal variation in the concentration of benzo(a)pyrene (BaP) in the atmosphere in the district of Osaka City was determined. Hydrocarbons in the sample were extracted by benzene for about 10 hours. Utilizing column chromatography with active alumina, 22 fractions of the extract were obtained. The nature of the hydrocarbons in each fraction was determined by ultraviolet spectrophotometry. Thin-layer chromatography (silica gel) was used to measure the concentration of hydrocarbons. BaP concentration in the dustfall (micrograms/sq m/month) in respect of various sample districts varied; industrial area 10.8, commercial area 7.1, residential area 5.2, suburban residential area 2.8. Seasonal variations of BaP were found to be 10.8 in the winter, 8.5 in the autumn, 4.7 in the spring and 1.0 in the summer. BaP concentration in the suspended matter micrograms/1000 cum air in the commercial district was 14.0 in the winter, 9.4 in the autumn, 5.7 in the spring and 2.7 in the summer. In the

suspended matter collected in the street crossing in the commercial district, with heavy automobile traffic, during the winter period the BAP concentration was 20 to 50 micrograms/1000 cubic air and higher than the corresponding BAP concentration in the industrial district. The ratio of BAP concentration to that of other polycyclic hydrocarbons was (setting BAP as 100): pyrene 90; fluoranthene 105; 1,2-benzanthracene 30; 1,12-benzperylene 95. (Author abstract)

02129

A. P. Altshuller

AIR POLLUTION. Anal. Chem. 35, (5) 38-108, Apr. 1963.

Author presents a literature review in the field of air pollution, January, 1961 to February 1962. There are two hundred forty (240) references.

02169

02169
H. H. Epstein, H. Spail, J. Kopian, H. Mantel, H. L. Falk, and H. Gavlicki.

PHOTODYNAMIC BIOASSAY OF POLYCYCLIC AIR POLLUTANTS. Arch. Environ. Health.

Fifteen fractions of organic atmospheric particulates from several American cities were bioassayed for photodynamic activity, and results obtained were expressed as apparent potencies relative to an arbitrary benzo(a)pyrene standard. All six crude benzene extracts assayed showed photodynamic activity, with a correlation evident between apparent relative potencies as chemical analysis. Five aliphatic fractions were photodynamically inactive. The single aromatic fraction tested had high activity. Three oxygenated fractions showed photodynamic activity, despite the absence from them of benzo(a)pyrene and other polycyclic hydrocarbons of known structure commonly found in atmospheric particulates. Such oxygenated fractions are reportedly carcinogenic. In recovery experiments, the constituents of neither crude benzene extracts nor oxygenated fractions interfered with the activity of added benzo(a)pyrene. Photodynamic bioassay of nine other polycyclic hydrocarbons commonly found in atmospheric particulates showed that their activities and/or atmospheric particulates showed that their activities and/or Atmospheric concentrations, generally, were so limited as not to contribute materially to the potencies of the air samples. This pilot study suggests that photodynamic bioassay may provide a rapid, simple, and economical biological index of potential carcinogenic hazard attributable to polycyclic hydrocarbons. The utility of the assay for this purpose should be further evaluated. (Author summary)

J. Air Quality Measurements

02210

J.P. Lodge, Jr. B.B. Barber

THE IDENTIFICATION OF ALIPHATIC AMINES IN AIR AS THEIR BENZAMIDES BY PAPER CHROMATOGRAPHY. Anal. Chim. Acta 24, 235-40, 1961.

A method is described for the separation of amines as their benzamides by paper chromatography. Data are given on separations in two systems. Rhodamine B extracts from 0.1 to 0.25 ug. can be separated on S & S 2043A paper. When radiosulfur labelled benzamides were chromatographed and placed on x-ray film for eight to ten days with subsequent development of the radioautograph, the lower limit of identification was found to be ca. 2.5 micrograms of each benzamide. The results of analysis for amines in two samples of air particulate matter, and one of atmospheric vapors are presented. (Author summary)JS

02225

E. Sawicki, W.C. Elbert, T.R. Hauser, F.T. Fox, T.W. Stanley

BENZO(A)PYRENE CONTENT OF THE AIR OF AMERICAN COMMUNITIES. Am. Ind. Hyg. Assoc. J. 21, [6] 443-51, Dec. 1960. (Presented at the 21st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 1960.)

Examination of the benzpyrene content in the air of 131 urban and non-urban areas in various parts of the country has disclosed that benzpyrene is universally present. Samples from sites in urban areas yielded higher concentrations of benzpyrene in the air and in air borne particulates than those from nonurban areas. The concentration of benzpyrene at these sites was found to vary from 0.01 to 61 micrograms per 1000 cu m of air. A 12-month study of the atmospheric benzpyrene concentration in nine large, widely separated American cities has shown that, for the majority, the concentration of benzpyrene in airborne particulates and in the air is at the highest level during the winter months and at the lowest level during the summer months. The concentration of benzpyrene in the benzene-soluble fractions of particulates from the air of different urban and nonurban areas varied from 0.00093 to 0.26 %. The concentration of benzpyrene in the airborne particulates of urban and nonurban areas varied from 0.00001 to 0.041%. In cigarette tar, the concentration of benzpyrene is in the range of 0.00003 to 0.000018. (Author summary modified)JS

02239

P.I. Larsen T.J. Konopinski

GUNNER TUNNEL AIR QUALITY. Arch. Environ. Health 5, 597-608, Dec. 1962. (A revision of a paper presented at the session on Constituents of Motor Vehicle Exhaust at the Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Southern California Univ., Los Angeles, Dec. 5, 1961.)

Aerometric studies of the Boston Sumner tunnel were conducted in July and Sept., 1961. The 35,000 vehicles/day that traveled this 2-way tunnel produced an average carbon monoxide concentration of 70ppm, in the tunnel, with instantaneous peaks as high as 257 ppm. The settling index values in Coh/1000ft. of air were approximately 1 for tunnel inlet air, 3 for the toll station, and 4 for tunnel outlet air. The amount of pollutants/vehicle mile of tunnel travel were; carbon monoxide 60 gm, total suspended 0.1b, organic suspended 0.1b, and particulate lead 0.3?. The relative significance of vehicular exhaust on outdoor concentrations was estimated for the suspended particulates measured. Ranked in order from most to least significant, the 1st several pollutants were carcinogen, benzo(a pyrene) benzo(g,h,i)perylene, lead total organics, iron, titanium, and total suspended particulate.##

02317

W.J. Bashagill J.L. Dallas

AIR QUALITY IN BOSTON, MASSACHUSETTS (NOVEMBER-DECEMBER 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Nov. 1964. 55 pp.

A short-term air contamination pilot study was conducted using a mobile air-sampling laboratory. This laboratory, designed and constructed by the Technical Assistance Branch, Division of Air Pollution, Public Health Service, contains continuous automatic equipment for monitoring air quality, manual air-sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory was used to: (1) obtain comprehensive measurements of gaseous and particulate air contaminants at a single test site, (2) train air-contamination investigators in the application of methodology, (3) evaluate and compare air-contamination measurement techniques, and (4) enhance public awareness of the air-contamination problem to encourage support for local air-contamination control and monitoring programs.##

02360

AIR QUALITY DATA FROM THE NATIONAL AIR SAMPLING NETWORKS AND CONTRIBUTING STATE AND LOCAL NETWORKS 1964-1965. Public Health Service, Cincinnati, Ohio, Division of Air Pollution pp. 128, 1966.

The Air Quality Section of the Public Health Service's Division of Air Pollution, with the assistance and cooperation of state and local agencies, carries on a variety of air sampling activities to obtain information about air quality in the United States. This report summarizes data gathered during 1964 and 1965 at nearly 300 stations that gathered bi-weekly samples of suspended particulate matter, about 30 stations that gathered bi-weekly samples of two gaseous pollutants, and another seven stations that continuously monitored six gaseous pollutants, suspended particulates and soiling index. This volume also continues the policy of including summaries of data contributed by state and local agencies that operate their own air sampling networks. This effort to bring together in one publication as much air quality data as possible is particularly important in

light of the continuing rapid expansion of state and local sampling activities. In addition to the basic data on suspended particulates and gases, data on several fractions of the particulate matter are included herein. (author abstract)##

02351

G.H. Hilst J.G. Bryan

PRELIMINARY METEOROLOGICAL ANALYSIS OF NATIONAL AIR SAMPLING NETWORK DATA. VOL. II. COMPARISON AND INTERPRETATION OF RESULTS (FINAL REPT.). Travelers Research Center, Inc., Hartford, Conn. (Rept. TRC-19). Jan. 1962. 73 pp.

This report is the second of a two-volume presentation of the analysis of relationships between particulate pollution levels and concomitant meteorological variables, both measured in urban areas. Data from 51 stations for the period 1957 through 1959 have been used for these analyses. The methodology for statistical discernment of the relationships between urban pollution levels and the meteorological variables observed routinely at nearby U.S. Weather Bureau stations for each area has been presented in Volume I. The results of application of these analytical techniques have also been presented there. In the present volume the comparison and interpretation of these results are presented and suggestions for future studies are outlined.##

02587

O. L. Danetskaya and P. P. Dikun

CONTAMINATION OF THE AIR OF A LARGE CITY WITH CARCINOGENIC AGENTS. (Issledovaniia kantserogennykh veshchestv i vozdushnogo basseina bol'shogo goroda.) Hyg. Sanit. 29, (7) 131-3, July 1964.
CFSTI: TT65-50021/7

Purpose of study was to determine the main potential industrial carcinogenic foci in a large city and the recommendation of measures for reducing the carcinogenic waste of these industries. These determinations were based on the polynuclear compound, 3,4-benzpyrene. Samples were taken at industrial sites such as concrete/asphalt plant, tar roofing plant and a rubber manufacturing facility. Recommendations for reducing the concentration of carcinogenic agents are: (a) the technical process should be altered in the direction of the greatest possible air-tight enclosure of the machine units; (b) all vapors should be recovered, and (c) old asphalt concrete plants operating in open yards should be replaced with new plants where the technical process is carried out in adapted buildings and the units for drying the ingredients are gasified. Recommendations for plants engaged in rubber manufacturing are: (a) powdery soot should be replaced with the granulated form in the rubber compounds; (b) all carcinogenic ingredients should be excluded from rubber compounds and replaced with noncarcinogenic ingredients and; (c) the units should be enclosed as much as possible.##

02693

A. V. Khatchenyan

DATA FOR SUBSTANTIATION OF THE PERMISSIBLE CONCENTRATION OF CHLOROPRENE IN THE ATMOSPHERIC AIR. [Materialy k obosnovaniyu predel'no dopustimoi kontsentratsii khloroprena v atmosfernom vozdukhe.] Hyg. Sanit. 29, [4] 15-8, Sept. 1964 CFSTI: TT65-60031/9

Determination was made of the sulfhydryl groups content in the brain and liver homogenates, as well as of the adenosine triphosphatase activity of the liver in rats. One group of the animals had been receiving chloroprene in concentrations of 0.58 plus or minus 0.03, 0.22 plus or minus 0.009 and 0.088 plus or minus 0.008 micrograms/cu m throughout 60 days and nights, and thereupon was immediately sacrificed. The other group of rats was sacrificed 15 days after the completion of the chloroprene administration. The threshold concentration of chloroprene in the groups was found to be 0.22 microgram/cu m. The effect produced by the substance in question on the sulfhydryl groups in the brain homogenates was that of a drop in their content by approximately 10 per cent as compared with control, while the effect on the adenosine triphosphatase activity in the liver manifested itself in the enhanced enzymic activity which increased approximately 30 per cent. The chloroprene concentrations under examination produced no statistically significant shifts in the sulfhydryl groups content in the liver homogenates. The investigations performed substantiate the USSR standard for maximum permissible concentration of chloroprene in the atmospheric air, the standard providing for the daily average value of 0.03 microgram/cu m. [Author abstract]

02762

L. Dubois, D.G. Reynolds, T. Teichman, J.L. Monkman

THE HYDROCARBON CONTENT OF URBAN AIR - A SIX MONTH SURVEY. J. Air Pollution Control Assoc. 14, (8) 295-8, Aug. 1964.

Flame ionization detection, with or without prior gas chromatographic separation, is probably the best method of continuously monitoring hydrocarbons in air. It can be used to monitor concentrations in both external air pollution, and also in plant atmospheres. Response to changes is rapid, and in air pollution studies some indication of inversion conditions is possible. It is planned to carry out future work using both approaches simultaneously, the gas chromatographic separation, and the total. It is hoped to operate on a 24 hr. basis to elucidate any daily trends, such as for example, the occurrence of maxima at 12.00 midnight to 2.00 am.

02822

S. Rochheiser and R. E. Natusi

AIR POLLUTION MEASUREMENTS IN INDIANAPOLIS (JUNE-JULY 1963). Public Health Service, Cincinnati, Ohio, Div. of Air

Pollution and Bureau of Air Pollution Control, Indianapolis, Ind. 67 pp.; July 1965

The Indianapolis Bureau of Air Pollution Control and the Division of Air Pollution, U.S. Public Health Service conducted a joint air pollution study in June and July 1963. A mobile air sampling laboratory was used in the study. This laboratory contained continuous automatic equipment for monitoring air quality, manual air sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory is used mainly to (1) obtain comprehensive measurements of gaseous and particulate air pollutants at a single test site in various communities, (2) train air pollution investigators in the application of methodology, (3) evaluate and compare air pollution measurement techniques, and (4) enhance public awareness of the air pollution problem and encourage support for local air pollution control and monitoring programs. Some of the data obtained in this study, such as the ranges of concentrations of air contaminants, relationships among levels of air pollutants, and the relationship of meteorological factors and air pollutant levels are presented here. Detailed tabulations of air pollution and meteorological measurements are given in the Appendix. (Author introduction modified)ES

02025

T. H. Breimhelt and R. E. Dahle, Jr.

AIR POLLUTION MEASUREMENTS IN BALTIMORE, MD. (MARCH AND APRIL 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Baltimore City Health Dept., Md., Bureau of Industrial Hygiene, Nov. 1964. 58 pp.
GPO: 817-288-3

Air pollution concentrations measured in this brief study are sufficiently great to justify further planning and development of an air resource management program in the Baltimore area. Conclusions based on the limited data of this study are as follows: Pollution due to particulate matter is higher than desirable. Atmospheric particulate concentrations exceeded 200 microgrames per cubic meter 5 out of 36 days of the study or 15 percent of the time. Soiling index values were rated as "heavy" or greater during 33 percent of the study period. Pollution due to sulfur dioxide is sometimes a problem. The average sulfur dioxide concentration during the study was 0.06 ppm but did reach an hourly concentration of 0.39 ppm. Photochemical-type smog was neither detected nor expected during the spring season. The relatively large concentrations of oxides of nitrogen, hydrocarbons, and aldehydes present suggest, however, that photochemically produced smog may be a problem during the summer months with the occurrence of greatest intensity and longest duration of sunlight. (Author conclusion modified)ES

02033

AIR POLLUTION IN ERIE COUNTY (COMPREHENSIVE AREA SURVEY REPORT NUMBER TWO.) New York State Air Pollution Control Board, Albany. 1963. 109 pp.

The objectives of this survey were: To determine, by means of a contaminant emission inventory, the relative contribution of the respective sources of air contamination to the overall loading of the community atmosphere. To determine population, land use, agriculture and industrial development trends and the ability of the air reservoir to dilute and disperse air contaminant emissions. To extrapolate, from applicable meteorological, air sampling and source data, the potential atmospheric concentrations of the more common air contaminants. To assess the effectiveness of presently applied emission controls and the administrative steps that have been and can be taken by government agencies to control both existing and potential air pollution sources.##

03968

S. Sawicki, T. R. Hauser, W. C. Elbert, F. T. Fox, and J. E. Hooker

POLYNUCLEAR AROMATIC HYDROCARBON COMPOSITION OF THE ATMOSPHERE IN SOME LARGE AMERICAN CITIES. Amer. Ind. Hyg. Assoc. J. 28, 137-44, Apr. 1967. (Presented at the Air Pollution Seminar, American Chemical Society, Chicago, Ill., Sept. 1964.)

The air of 19 American cities was examined for the following polycyclic hydrocarbons: pyrene, benzo(a)pyrene, benzo(e)pyrene, benzo(k)fluoranthene, perylene, benzo(g, h, i)perylene, anthanthrene and coronene. Usually, fluoranthene, chrysene, and benz(a)anthracene were also found in ambient air samples. In all urban samples the concentration of the polycyclic aromatic hydrocarbons was generally greater in winter than in summer. The ratios of benzo(a)pyrene to benzo(g, h, i)perylene and to coronene are introduced as possible indicators of air pollution due to automobile exhaust fumes or coal combustion pollution. (Author abstract)##

03028

SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Oct. 1965. 16 pp.

This report contains data gathered during 1962, 1963, and 1964, with the data from 1964 presented more extensively than data from the earlier years. The annual average concentrations, the maximum and minimum monthly average concentration, and the maximum daily concentration of the several pollutants monitored are summarized. The minimum daily average concentration was, in each case, below the minimum concentration detectable by the instruments. The following summaries are contained in tables: 1964 average and maximum pollutant levels in greater detail for the several cities; relative cumulatively frequency distributions for 1964 of basic CAMP data recorded at 5-minute intervals, and similar distribution of data for 1962 and 1963. These frequency distributions permit the ready determination of the concentration that was exceeded only 5 percent of the time, the median concentration. Total oxidant data for 1964 in the form of the number and percent of day when the maximum hourly total oxidant concentration equalled or exceeded 0.15, 0.10 and 0.05 ppm; and the average and maximum sulfur dioxide levels for 1964.##

03017

A. D. Williams, F. D. Haddon, T. O. Harris, C. H. Copley, Jr., and W. Vand Dorkenburg, Jr.

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. VI. EFFECTS OF AIR POLLUTION. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control 46 pp., Dec. 1966

The Air Quality Goals Subcommittee, appointed under provisions of Area 5-A-5 of the Interstate Air Pollution Study Phase II Project Agreement, reviewed literature, met with consultants in the air pollution effects field, and selected air quality goals for consideration by the Project Executive Committee. The Committee limited its consideration to goals because it does not have authority to adopt air quality standards, a function restricted to legally constituted governmental agencies. The Committee does, however, by approving this report, accept the consensus of professional and technical personnel. The explanations of effect levels presented herein were prepared by the staff of the Public Health Service Technical Assistance Branch who utilized the advisory resources available within the Division of Air Pollution. The effects of air pollution as a program element, is only one part of an air resources management program. Air pollution effects, air-quality levels, and pollutant emissions are the major program elements that provide the basis for air quality goals. Actually, if no consideration were given to the length of time needed to reach goals or to the priorities of community needs, air pollution effects would be the only program element to be considered in establishing goals. Suggested goals are listed and are based on the air quality indicating major types and amounts of pollutants present as well as actual and anticipated effects of air pollutants in the Interstate Air Pollution Study area. The effects of air pollution have been considered in this report from the viewpoint of a consultant whose task has been the development of a set of goals that will meet the future need of the area. Some of the quantitative relationships between effects and air quality levels have not yet been established, but enough is known that a guide for a constructive air resource management program has been provided for the Interstate Air Pollution Study area. This guide is intended to serve the needs of the study area only, and is not intended to have general application.##

03109

H.E. Wohlers H. Faldstein

INVESTIGATION TO DETERMINE THE POSSIBLE NEED FOR A REGULATION ON ORGANIC COMPOUND EMISSIONS FROM STATIONARY SOURCES IN THE SAN FRANCISCO BAY AREA. J. Air Pollution Control Assoc. 15, (5) 226-9, May 1965.

On the basis of evidence presented, it is concluded that photochemical smog is a major air pollution problem in the San Francisco Bay Area. Attempts should be made to reduce the intensity of photochemical smog effects by controlling the emission of organic compounds to the atmosphere. In order to reduce the intensity of photochemical smog effects in the

Bay Area, it is estimated that an 80 percent total reduction of organic material emitted to the atmosphere is necessary. The nitrogen oxide problem needs clarification. Because of the complexity of the photochemical smog reaction in open atmospheres, technical answers to all phases of the problem are not available.##

01361

M. S. Sokolovskii, Sh. L. Gabinova, B. V. Popov, L. F. Kachor, and B. B. Levine, "Translator"

SANITARY PROTECTION OF MOSCOW ATMOSPHERIC AIR (U.S.S.R. LITERATURE ON AIR POLLUTION AND RELATED OCCUPATIONAL DISEASES, VOLUME 14). Moscow Sanitary-Epidemiological Station. 1965. 68 pp.
CFSTI, TT 67-60048

Moscow is a large industrial center with various types of industries discharging a complex of solid and gaseous, organic and inorganic chemical substances into the air, causing considerable damage to the National economy. This work reviews the Moscow Sanitary Service in its efforts to control air pollution from the many sources described.##

01809

D. S. Mathews J.J. Schuenemann

MANAGEMENT OF DADE COUNTY'S AIR RESOURCES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. (In cooperation with Florida State Board of Health and Dade County Dept. of Public Health, Fla.) Oct. 1962. 43 pp.
PHS

Metropolitan Dade County has a long history of being a desirable area in which to live, work, and play. A great sub-tropical agricultural industry abounds. Tourism is one of the largest income producing industries in this area. Population and urban development are increasing rapidly. In general, these trends have to reduce agricultural income. Due to the dominance of tourism and agriculture, economic return has been somewhat uncertain and has not been balanced equally throughout the year. To compensate for this situation, a significant effort is being put forth to bring new kinds of income producing activities into Dade County. A specific proposal has been made to construct and operate a petroleum refinery near Homestead as part of an extensive industrial development. The Dade County Manager and the Dade County Department of Public Health requested technical assistance from Florida State Board of Health and the United States Public Health Service in reviewing the refinery proposal, evaluating it spossible environmental effects and in planning a long range air resource management program. Air pollution aspects are considered and presented herein. (Author introduction modified)##

03409

G. J. Raschke

AN APPRAISAL OF AIR POLLUTION IN MINNESOTA. Minnesota Dept. of Health, Minneapolis, (in cooperation with the Public Health Service.) Jan. 1961. 78 pp.

This appraisal of the air pollution situation in Minnesota arose from a growing concern about air pollution problems in the state. Increasing requests for information and assistance registered with the State Department of Health Service were obtained concerning methods of conducting a survey which would establish the nature and extent of the air pollution problem in the state and indicate what activity is needed on the part of the state and local governments in meeting the problem. Data used in preparing this report were obtained by interviews, direct observation, questionnaires, limited air sampling, and review of existing information. The appraisal was made from October 1959 to July 1960.##

03410

A STUDY OF AIR POLLUTION IN MONTANA JULY 1961 - JULY 1962. Montana State Board of Health, Helena Division of Disease Control. 1962. 110 pp.

The principal pollutants in the air were determined with the staff and analytical equipment available to the State Board of Health and some idea as to the carcinogenic potential of the materials in the air in the various cities as well as the over-all characteristics in each of the cities were determined as a base-line for future reference. Emission inventories are included.##

03426

E. C. Tabor, J. F. Decker, and J. H. Leavitt.

AIR POLLUTION IN ST. BERNARD, OHIO. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, 1958. 17 pp. MEM

An area survey was conducted in St. Bernard, Ohio. It was determined that the levels of suspended particulates and crude organics were considerably higher than that in downtown Cincinnati for the same days. The average levels of 270 micrograms of suspended particulate per cubic meter of air and 65.5 micrograms of crude organics per cubic meter of air were somewhat higher than for other communities of size comparable to St. Bernard. Nitrate and sulfate concentrations also were slightly higher. The highest levels of sulfur dioxide, while not high enough to be of great concern, were associated with northerly winds. On several occasions the level of oxides of nitrogen was high enough to be detectable by the odor. The large amount of aliphatic hydrocarbons in the organic matter was very unusual. It was considerably higher than that from any other community in the United States for which similar measurements have been reported. The soiling power of the air was higher when the wind blew from the North.##

03833

F. A. Bell, Jr.; G. Bissel, Jr.; ?; H. Hushover; L. B. Perry, F. J. Schuette, and E. Vihman.

FRESNO AIR POLLUTION STUDY. Public Health Service, Washington, D. C.; Div. of Air Pollution; California State Dept. of Public Health, Berkeley; and Fresno County Health Dept., Calif. July 1960. 20 pp.
HEW

Haze and other air pollution effects have occurred in the Central Valley of California. In order to answer questions regarding present pollution levels and to estimate the future pollution potential of an area which is just beginning to experience air pollution, Fresno was selected as a representative growing metropolitan area of the Central Valley. Air pollution concentration levels together with visibility reduction measurements and subjective observations indicate that photochemical smog occurs in the Fresno area. The Fresno rural station in Kearney Park had AISI particulate matter results which were in general higher than the results at the Fresno city station. AISI particulate matter results indicate that episodes of air pollution occur widely throughout the Valley. Comparisons of average results from stations at Fresno, at Kearney Park, Sacramento, Stockton and Bakersfield show that the AISI results were two to four times higher for the December 3-9 period than for the September 10-17 period for all stations. An estimate of pollutants being emitted to the atmosphere indicates that motor vehicles are the main and most significant sources of smog-forming raw materials in the Fresno area.##

03841

CLEAN AIR FOR CALIFORNIA (INITIAL REPORT OF THE AIR POLLUTION STUDY PROJECT, CALIFORNIA STATE DEPT. OF PUBLIC HEALTH). California State Dept. of Public Health, San Francisco. Mar. 1955. 80 pp.

This is an early survey report of the air pollution situation in California. The body of knowledge, available at that time, on the growing problems of polluted air is discussed and a plan for action outlined. Attention is focussed on the air pollution problem in the Los Angeles area, where eye irritation, plant damage and other harmful effects, such as discomfort, decreased visibility and nuisance occur most frequently. Recommendations to State and local governmental authorities, to universities and other research organizations, to the industry and public are made.#

03851

BI-STATE STUDY OF AIR POLLUTION IN THE CHICAGO METROPOLITAN AREA. Indiana State Board of Health, Illinois Dept. of Public Health, Springfield and Purdue Univ. Lafayette, Ind. 1959. 151 pp.

The population of the Chicago area, as a whole, has evidently not yet experienced great inconvenience because of air pollution. However, with the increased growth of the area both population-wise and industrially it is important that knowledge of the present conditions be obtained to protect the public well-being and to prevent future conditions that may have an adverse effect

upon the citizens of the area. Some of the conclusions resulting from the Bi-State Study of Air Pollution in the Chicago Metropolitan Area are: (1) The Chicago Area is an extensive heterogeneous area consisting of a complexity of domestic, commercial, and industrial activities which emit a variety of foreign materials to the atmosphere; (2) Air pollution problems may transcend local boundaries and require intercommunity cooperation for their solution; (3) Prior studies show an early awareness of the presence of foreign materials in the atmosphere in concentrations varying with local and meteorological conditions; (4) The probable major contributors of material to the air in the Chicago Metropolitan Area and their probable major emissions are: (a) Poor community housekeeping - wind-generated particulate matter; (b) Burning of refuse in open dumps and backyard incinerators-products from incomplete combustion of organic and inorganic matter; (c) Residential and small commercial and industrial heating plants - products from incomplete combustion of coal; (d) Automobile exhaust - products from combustion of gasoline; (e) Electric utilities - combustion products; (f) Domestic and industrial combustion of fuel oil - combustion products; (g) Primary metals industry - particulate matter; and (h) Petroleum refineries and gasoline handling facilities - hydrocarbons.##

03458

W. F. Cope, Chairman.

SMOKE AND AIR POLLUTION - NEW YORK - NEW JERSEY. Interstate Sanitation Commission, New York City, Feb. 1958, 95 pp.

Pollution in the metropolitan area was studied by: aerial reconnaissances and photography; and surveys in the communities. Significant information was collected on: relationships of meteorology, visibility and pollution; interstate movement of pollution as indicated by releasing tracer dust in one state and collecting in the other; amount of vehicle exhaust fumes and other organic materials in the air; sulfur dioxide concentration on Staten Island, and ozone on Staten Island and in Carteret, N.J.; effects of the polluted atmosphere on health, vegetation, materials and transportation; and a study and evaluation was made of existing laws in the State of New York, New Jersey and Connecticut, and other jurisdictions. Air pollution originating in regions of New York and New Jersey within the New York Metropolitan Area is interstate in character, affects public health and comfort adversely, and damages property. While the control and abatement of air pollution at its sources is the primary obligation of the states, counties or municipalities in which it originates, the problems of interstate air pollution cannot be solved wholly by governmental agencies independently of one another. The abatement of existing interstate air pollution and the control of future interstate air pollution is of prime importance to the persons living and industry located in the area affected thereby, and can best be accomplished through the cooperation of the states involved, by and through a common agency or instrumentality. An interstate instrumentality, employing the administrative practices followed by the Interstate Sanitation Commission in the abatement of interstate water pollution, should be created to deal with the problems of interstate air pollution. Drafts of proposed legislation to meet the situation described in this report should reflect fully the opinions and needs of many agencies, local governing bodies,

members of the legislatures, representatives of industry, and of the public. There has been insufficient time between the completion of the study and the submission of this report to afford opportunity to interested agencies to express their views on the form which legislation to abate interstate air pollution should take.##

03858

D. R. Keagy and J. J. Schuenemann

AIR POLLUTION IN THE BIRMINGHAM, ALABAMA, AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Dept. No. A58-8.) May 1958. 80 pp.
NEW: A58-8

The purposes of this survey were to: (1.) Review the existing and potential air pollution situations. (2.) Review existing air pollution control activities; and (3.) Develop recommendations for organization, staff, facilities, program, and legislation relative to air pollution control activities. The scope of the study was limited to consideration of available information relative to air pollution including: types of activity which cause pollution, evidences of pollution levels, meteorological and topographical influences on the dispersion of pollutants, existing or authorized governmental activity for control of air pollution, and other relevant community characteristics. The study area was the boundary of Jefferson County.##

03862

E. E. Leuke, H. E. Shaffer, and J. A. Vernon

SUMMARY OF AIR POLLUTION DATA FOR LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif., Engineering Div.

Emission concentrations of pollutants for Los Angeles, California are given. The levels cited are a result of the Board of Supervisors of Los Angeles giving the authority to the Air Pollution Control District - County of Los Angeles. Also included are sixty-two (62) industrial control programs started in the Los Angeles area, along with the dates installed and the cost.##

03904

E. R. Hendrickson, D. R. Keagy, and R. L. Stockman

EVALUATION OF AIR POLLUTION IN THE STATE OF WASHINGTON (A JOINT REPORT WITH THE STATE OF WASHINGTON DEPARTMENT OF HEALTH-JULY 1 THROUGH NOVEMBER 30, 1956). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. 1957. 165 pp.

The objective of this study was to estimate the current and potential air pollution problems in the State of Washington and to provide a basis for the State to determine the appropriate action it should take. The survey consisted of a study of

population distribution and trends, geography and topography, meteorology and climatology, and existing and potential sources of pollution. The sources of pollution which were considered include transportation, domestic activities, agricultural practices, industrial activities, refuse disposal, out-of-state sources, and natural sources. In addition, a determination was made of available resources in the State for research and investigation in air pollution problems. On the basis of the findings of this state-wide survey, it is recommended that: (1) Air pollution be recognized as a matter of State concern. (2) Ways and means of prevention and control of air pollution, including consideration of local and regional aspects, be investigated. (3) A continuing State program include surveillance, study and cooperation and (4) An agency be designated to represent the State in interstate and Federal air pollution matters.##

03505

R. D. Hernadez and J. H. Tillman

AIR POLLUTION IN THE EL PASO, TEXAS AREA. El Paso City - County Health Unit, Texas. 1959. 104 pp.

The primary purpose of this study was to obtain basic scientific air pollution data concerning the type, extent, source, and effect of the waste from industry and other air pollution in the El Paso area. Another purpose was to determine the need and nature of a permanent air pollution control program. The scope of the program was limited by two factors; the gathering of those samples which were within our means to analyze and the collection of pollutants commonly found in any city.##

03506

P. A. Hanlon

AIR POLLUTION IN CHARLESTON, SOUTH CAROLINA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Rept. A60-6.) 1960. 32 pp.
HEW: A60-6

At the request of the South Carolina Department of Health and with the cooperation of the Charleston County Health Department, the Public Health Service made an appraisal of factors relating to air pollution in the Charleston area. The purpose of this appraisal was to determine the status of the air pollution situation, and the need for government activity in solving air pollution problems. This report is an analysis of information collected relating to sources of pollutants, dispersion of pollutants, indication of pollution levels, and the status of local activity in the air pollution field. Charleston lies in an area of frequent stagnating high pressure systems - the meteorological model associated with major air pollution episodes - and for this reason, bears surveillance. However, because of its proximity to the Atlantic Ocean and its level topography, Charleston usually receives good ventilation in part because of the sea breeze. This advantageous phenomenon decreases inland. The atmospheric pollutants of immediate concern derive from industrial sources. However, domestic, commercial, and municipal sources do contribute to the overall pollution load of the

atmosphere. To date, public complaints relate to nuisances, particularly industrial odors. There have also been a few allegations of vegetation and property damage. Measurements by the Public Health Service's National Air Sampling Network in the City of Charleston indicate that the particulate loading is not excessive, as judged by comparison with cities of comparable size. The sampler is located in the center of the city and is not indicative of pollution levels in other areas. Of greatest interest and concern is the North Charleston "neck" which contains within a limited area a complex of air pollutant sources and residences. No data are available to indicate pollution levels in this area, although analysis of the Network data implies that they are significantly higher than in the city. There is presently no local or State air pollution program, nor is there routinely available to the local area any agency with authority and competence in this field. On the basis of this appraisal and the general available knowledge relating to air pollution, the following recommendations are made to the Charleston County Health Department. (1) Information should be developed relating in detail to air pollution levels and sources in the Charleston area, particularly to the north of the city limits. (2) A modest public education program should be undertaken. (3) A modest air pollution program should be developed within the County Health Department.

03526

P. Stocks, B. T. Cossins, R. V. Aubrey

A STUDY OF POLYCYCLIC HYDROCARBONS AND TRACE ELEMENTS IN SMOKE IN MERSEYSIDE AND OTHER NORTHERN LOCALITIES. Intern. J. Air Water Pollution 4, (3/4), 161-81, 1961.

Smoke samples collected continuously for one or more years by filter in Merseyside conurbation and elsewhere in northern England and Wales were analysed for 7 polycyclic hydrocarbons and 13 trace elements. The locations included seaside and riverside, small and large towns, a smokeless zone, the Mersey Tunnel, bus and motor car garages, an office and a steelworks. The amount of corrosene in smoke varied little in town or country but the higher levels in tunnel smoke and in the motor garage were such a to suggest its usefulness for measurement of air pollution by motor traffic. In country places amounts of smoke and of the hydrocarbons were 2 1/2 times as great in the autumn-winter half of the year as in the spring-summer half, but in Merseyside, whilst the seasonal ratio for total smoke was similar, for the hydrocarbons it was about 5 to 1. Indoor office air was less polluted than that outside in winter, the hydrocarbons showing a seasonal ratio about 4 to 1. Trace element concentrations in air were all higher in urban than in country places but only for antimony, vanadium and molybdenum was the excess relatively greater than for total ash. Mersey tunnel air contained very much greater amounts of lead than did the entering air, and in a motor garage the air contained more lead and vanadium than the air outside. In the smokeless zone trace elements were present in smaller amount than at the town centre. In the boiling-mill shed and melting-shop of the steelworks, concentrations of all the elements, particularly of copper, were largely, increased. (Author abstract)##

03685

J. H. Campbell and L. Kreyberg

THE DEGREE OF AIR POLLUTION IN NORWEGIAN TOWNS. Brit. J. Cancer (London) 10, 501-8, 1956.

3:4 Benzpyrene has been estimated in samples of atmospheric smoke (suspended matter) in Oslo and a number of smaller towns in Norway, and these results are compared with similar values previously obtained for towns in England and Wales. (Author summary modified)##

03910

R. Ubaidullaev

EFFECT OF LOW CONCENTRATIONS OF METHANOL VAPOR ON MAN AND ANIMALS. Hyg. Sanit. 31, (4-6), 8-12, Apr.-June 1966.
Runs. (Pr.)
CFSTI TT 66-51160/4-6

The maximum one-time and daily average permissible concentration of methanol in the atmosphere was determined. The threshold value of smell of the substance, its effect on the light sensitivity of eyes and that on the electric activity of the cerebral cortex of man was ascertained. Chronic 24-hour poisoning of albino rats was carried out for a period of 90 days. This experiment included a study of the chronaxy of muscle antagonists, the cholinesterase activity of the whole blood, the coproporphyrin excretion with the urine and the determination of the total amount of proteins and protein fractions in the blood serum. On the basis of the results obtained it is recommended that the maximum one-time and daily average permissible concentration of methanol in the atmosphere be set at a level of 1 and 0.5 mg/cu m respectively. (Author summary)##

03925

M. M. Moiseeva

THE DETERMINATION OF 3,4-BENZPYRENE IN THE AIR IN TASHKENT. Hyg. Sanit. 31, (4-6) 116-20, Apr.-June 1966.
Runs. (Pr.)
CFSTI, TT 66-51160/4-6

Air samples from the city of Tashkent were taken by an aspirator, this method having been used for 3,4-benzpyrene studies in the USSR and abroad. The results show that the contents of 3,4-benzpyrene in different districts of Tashkent varied from 0.55 to 11.2 micrograms per 100 cubic meters air. In the residential zone without industrial enterprises its content was 0.58 to 2.3 micrograms per 100 cubic meters. The highest concentration of this carcinogenic substance, 9.7 to 11.2 micrograms per 100 cubic meters, was found in the northern industrial zone. The concentration of 3,4-benzpyrene was comparatively low (0.8 microgram per 100 cubic meters) in the zone of the footmaking and abrasives-making factories which burned gas, and this low concentration is probably due to the

complete combustion of the fuel. Samples were taken at 15 different points using the best method of aspiration. The results provide a fairly complete picture of the degree of contamination with 3,4-benzpyrene of the air basin of the large industrial city of Tashkent.##

03930

S. A. Pigalev

POLLUTION OF AIR BY A SYNTHETIC RUBBER PLANT. Hyg. Sanit. 31, (4-6) 253-6, Apr.-June 1966. Russ. (7r.)
CFSTI, TT 66-51160/4-6

The principal and general professional hazard in the manufacture of any type of synthetic rubber are the liberated gases. The pollution of air by vapors of toxic compounds is possible at all stages of the technological processes, including the initial stages (synthesis, isolation and fractionation of the monomer) as well as in the final operation of the processing of the manufactured rubber. The plant investigated manufactures two kinds of rubber, the isoprene and the divinyl-alpha-methylstyrene rubbers. This plant discharges up to 162.2 kg of alpha-methylstyrene, up to 98 kg of unsaturated hydrocarbons, and up to 5 kg of ammonia into the atmosphere per hr. The atmospheric air was sampled by aspiration when the plant was working at full capacity, at a distance of 0.5 to 1.5 km from the source. Studies revealed a zonal nature of distribution of these substances in the atmosphere, their concentration diminishing at greater distances from the pollution source. The concentrations in the zone of 500 to 1500 m from the pollution source exceed the one-time maximum permissible concentrations for atmospheric air. It was determined that the discharge of harmful products of synthetic rubber manufacture into the atmosphere can be reduced by further improvements in the technological process and in equipment, in the construction of ceilings and in operation of the equipment.##

03931

V. A. Romanova

ATMOSPHERIC POLLUTION IN THE AREA OF PESTICIDE STOREHOUSES. Hyg. Sanit. 31, (4-6) 253-6, Apr.-June 1966. Russ. (7r.)
CFSTI, TT 66-51160/4-6

Operation of new rural industries and the use of poisonous chemicals in the fields and orchards involve the danger of atmospheric and soil pollution in rural areas, which may have a detrimental effect on the health of the population. The presence of atmospheric pollution in the area of pesticide storehouses and its effect on the feeling of well being, living conditions and health of the population residing in the area was investigated. The presence of pesticides near the storehouses was investigated by taking and testing 156 samples of air, including 30 samples for organomercuric compounds, 68 organophosphorus compounds and 28 samples for organochlorine substances. Organomercuric compounds were determined and scaled to thiophos or metaphos according to

Tretsenko's method based on the decomposition of thiophos and metaphos with acidiric acid with the formation of p-nitrophenolate. The contents of organophosphorous and organomercuric compounds in the air are listed in the table. No organochlorine mixtures were detected. It was concluded that operation of new pesticide storehouses can be permitted only after internal repairs in the buildings, and adequate equipment of servicing premises and packaging room, and the installation of ventilation. In order to avoid poisoning cases among the local population, the pesticide storehouses must be surrounded with a fence, adequately locked and guarded.##

04091

Sh. I. Gabinova, A. A. Vasil'eva, N. Kh. Shiyanskaya, and M. D. Manita

EXPERIMENTAL STUDY OF ATMOSPHERIC AIR POLLUTION WITH 3,4-BENZPYRENE IN INDUSTRIAL SECTIONS. Gigiena i Sanit. 29, (6) 65-9, June 1964. Russ. (Tr.) (Translated by B. S. Levine in U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 12.)

The purpose was to obtain more complete and up-to-date information on the state of Moscow atmospheric air pollution with 3,4-benzpyrene, on the basis of which rational sanitation means could be developed for the protection of atmospheric air against pollution with 3,4-benzpyrene. The first investigation was centered around industrial enterprises which had been only slightly surveyed with regard to the presence of 3,4-benzpyrene in the air and which, by the nature of their processing and production, lent themselves to the introduction of appropriate sanitization measures. The 3,4-benzpyrene determinations were made by fluorescent spectral method in the following order: in the primary raw material, in the intermediate and final products, in dust settled from the atmospheric air, and in dust collected by aspiration. Analyses were conducted in the physico-chemical laboratory of the Moscow Sanitary Epidemiological Station. The authors conclusions are as follows: It has been established that some raw materials, intermediate and final products used or manufactured by the investigated industrial plant contained detectable quantities of 3,4-benzpyrene; samples of settled dust collected in the proximity of the investigated plants also contained detectable quantities of 3,4-benzpyrene. Samples of aspirated atmospheric air collected on the electrode plant grounds during August-November of 1961, contained 3,4-benzpyrene in 0.4-2.11 gamma per 100 cu m of air. On the basis of this orientation investigation and sanitary-hygienic examinations, certain sanitization and air pollution protection means have been recommended and instituted in the investigated plants. The present report presents results of the first stage of a general investigation to be conducted in the future on a broader and profounder scale.##

04016

J. E. Dickinson

AIR QUALITY OF LOS ANGELES COUNTY (TECHNICAL PROGRESS REPORT - VOLUME II). Los Angeles County Air Pollution Control District, Calif. Feb. 1961. 305 pp.

Volume II of the Technical Progress Report is concerned with chronicling the air monitoring program of the Los Angeles County Air Pollution Control District between 1951 and 1959. Topics covered include: Chemistry of the Atmosphere; Air Monitoring; Evaluation of Smog Effects Data; Estimation of Total Air Pollution in Los Angeles County; Utilization and Analyses of Total Air Pollution Data. Without the data accumulated as the result of the sampling programs of 1951-57 it would not have been possible to discover the unique problems involved with Los Angeles smog and to determine what kind of control measures would be needed to abate them. Thus, it was possible (1) to identify in the atmosphere the contaminants considered to be the most important with regard to photochemical smog formation theory; (2) to establish their approximate concentration ranges; (3) to confirm theories of photochemical smog formation and transport; and (4) to define the areas of the Basin most severely affected by smog and the areas in which most of the contaminant sources were concentrated. Correlation between meteorological trends and smog occurrence, without radical change in emission concentrations, indicate the importance of weather conditions to smog occurrence.##

06651

B. T. Commins R. E. Waller

OBSERVATIONS FROM A TEN-YEAR-STUDY OF POLLUTION AT A SITE IN THE CITY OF LONDON. Atmos. Environ. 1, (1) 49-68, Jan. 1967.

As part of an extensive study of the effects of air pollution on health, measurements of pollution have been made at a site in London for more than ten years. The results of daily measurements of the concentration of smoke and sulfur dioxide made throughout that period and of more frequent measurements made during episodes of high pollution are reported. These show a reduction in the annual mean and peak concentrations of smoke during the ten year period, but there have not been any significant changes in the concentrations of sulfur dioxide. Occasional measurements of a wide range of other pollutants are also reported and results from a series of measurements of polycyclic aromatic hydrocarbons indicate a decline in the concentration of this potentially carcinogenic component of pollution in London. (Author abstract modified)##

06770

J. E. Yocom, J. A. Farrow, P. R. Gagnon and J. C. Nagyvary

AIR POLLUTION STUDY OF THE CAPITOL REGION (INTERIM REPORT). TAC Service Corp., Hartford, Conn. 1968. 65 pp.

The objectives were: (1) Evaluate the air pollution problem in the Capitol Region, both existing and potential with emphasis on the latter. (2) Procure data for determining the need for a regional air pollution control program and delineate rational boundaries for such a program. The purpose of this Interim Report is to present and summarize the completed Source Inventory and to report on the status of the other phases of the study. The pattern of air pollution emissions is strongly related

to land use and road systems and is regional in nature. Although the towns making up the Capitol Region differ widely in character, the pattern of emissions are not related to town boundaries. Carbon monoxide emissions are related almost entirely to automobile use. Automobiles are also the principal contribution to hydrocarbon emissions, but home and municipal refuse burning and industrial processes make significant contributions. Nitrogen oxides are contributed in almost equal amounts by automobiles and heating systems. This accounts for the relatively even distribution of this pollutant. Sulfur oxides are produced mainly in industrial heating and power generation plants burning high sulfur fuel. Therefore the emission of this pollutant type is closely related to industrial land use. Particulate matter is produced largely by industrial heating and manufacturing processes with significant contributions from domestic and municipal refuse burning. The distribution of particulate emissions is dependent to some degree on land used for heavy industry such as metallurgical and mineral processing. Levels of pollutants measured were, in general, low. Except for a few days, weather conditions readily dispersed pollutants before they could accumulate. High concentrations of pollutants occurred during a prolonged stable atmospheric condition during late November as recorded by the State Department of Health. The differences in pollutant levels from station to station, could, in general, not be accounted for based on surrounding land use and estimated emissions (Source Inventory) without specific knowledge of the prevailing weather patterns. Inversions occur frequently during the night and early morning hours in both the Connecticut and Farmington Valleys. Only two of the towns in the Capitol Region have specific regulations governing emissions of air pollutants. Most of the towns have some measure of control over potential air pollution emissions by means of zoning ordinances.**

6881?

H. H. Hovey, Jr.

AIR POLLUTION IN WESTCHESTER. Westchester Cooperative Air Pollution Control Study, Westchester County, New York. (In cooperation with Mount Vernon City Health Dept., New Rochelle City Health Dept., Westchester County Health Dept., and Yonkers City Health Dept.) 1965. 86 pp.

Within the framework of the New York State Air Pollution Control Act a series of air pollution surveys was initiated to provide data for carrying out the directive in the law. Among these was a comprehensive study of the air pollution potential in Westchester County, undertaken from July, 1962, until September, 1964, as a cooperative effort by the Mt. Vernon, New Rochelle, and Yonkers City Health Departments and the Westchester County Health Department. The objective of this study was to define the nature and extent, and causes and effects of the air pollution potential in Westchester County. Both the industrial and nonindustrial air pollution potential were studied by conducting an inventory of possible air contaminant sources to determine contaminant emissions within the county. The inventory was supplemented by an atmospheric sampling network consisting of 21 stations located throughout the county. Recommendations were based on the findings from combined inventory and atmospheric sampling data. Many problems are created by the 182,000 tons of air contaminants (exclusive of CO,

estimated to be more than 830,000 tons per year) emitted annually to the outer air in Westchester County, although there are no major county-wide air pollution problems. Traffic concentrations in the southern portions of the county tend to increase the potential problem from CO. Westchester County has a meteorological regime relatively favorable to good dispersion and diffusion of contaminants in the atmosphere. Only 23% or 42,000 tons of Westchester County's air contamination comes from industrial sources while 78% or 140,000 tons of the total contamination comes from nonindustrial sources. Of this amount over 100,000 tons comes from motor vehicle and other transportation sources. Southern Westchester County is densely populated and has most of the county's industry with the exception of the villages of Dobbs Ferry, Elmsford, Larchmont, North Pelham, Pelham and Scarsdale, and the City of Rye.##

04814

New York State Air Pollution Control Board, Albany. 1965. 15 pp.

AIR POLLUTION/CHEMUNG COUNTY SUPPLEMENT TO COMPREHENSIVE AREA SURVEY REPORT NUMBER ONE (GREATER ELMIRA).

Since the degree of air pollution is low in this rural portion of Chemung County, proper steps would be taken to insure continuing low levels of air contaminants. All new sources of air pollution can be controlled by adherence to rules and regulations promulgated by the New York State Air Pollution Control Board in 1962. Local officials, in cooperation with the Board, can insure new sources or modifications to existing sources and meet minimum requirements as established by the Board. Rules and regulations for this area should be made at the same time as those for Greater Elmira, using ambient air quality objectives as promulgated by the Board. When applying the ambient air quality objectives, both the present survey area and Greater Elmira should be classified as one region. In this manner, all of Chemung County may have a uniform set of rules and regulations at the same time. Refuse disposal practices should be reviewed in each community. Open burning of refuse by private individuals should be prohibited and central collection instituted. Disposal should be properly-operated, sanitary landfills or any other acceptable method. (Author summary)##

05864

New York State Air Pollution Control Board Albany. 1964. 96 pp.

AIR POLLUTION - NIAGARA COUNTY (COMPREHENSIVE AREA SURVEY Report number three).

The objectives of this study are to define the nature and extent of the air pollution potential in Niagara County so as: (1) To provide information by which rules and regulations can be established for the control of existing air pollution; (2) To provide technical data needed for implementation of a practical and reasonable air pollution abatement program; (3) To assess the effectiveness of existing controls and determine what steps must be taken by governmental agencies to control both existing and

potential air pollutions; and (4) To provide background data needed to check the effectiveness of any future control program.##

04930

J. M. Colucci and C. R. Begeman

THE AUTOMOTIVE CONTRIBUTION TO AIR-BORNE POLYNUCLEAR AROMATIC HYDROCARBONS IN DETROIT. J. Air Pollution Control Assoc. 15, (3) 113-22, Mar. 1965.

The aim was to determine the contribution by automotive vehicles to the polynuclear aromatic hydrocarbons in city air. Sampling of particulate matter at the rate of 140 cu m/min 5000 cfm) was carried out at two heavily-trafficked sites in Detroit and one suburban site in Warren, Michigan. Carbon monoxide was determined continuously, and particulate matter was analyzed for "tar," polynuclear aromatic hydrocarbons, lead, vanadium, and sulfates. Polynuclear aromatic hydrocarbons in automobile exhaust gas are assumed to be dispersed in air along with carbon monoxide or lead from automobiles. It is further assumed that automobiles are the sole source of carbon monoxide and lead in the atmosphere. Concentrations of carbon monoxide and lead in exhaust gas and in the air are utilized to estimate the percentage of polynuclear aromatic hydrocarbons in the air attributable to automobiles. The mean automobile contributions to benzo(a)pyrene in the air, based on lead concentrations, were 18% at a Freeway interchange, 5% in a downtown commercial area, and 92% in suburban Warren. The average concentrations of benzo(a)pyrene at the sites were 6 micrograms/1,000 cu m, 7 micrograms/1,000 cu m and 1 microgram/1,000 cu m, respectively. Mean contributions based on carbon monoxide concentrations were approximately twice the levels based on lead concentrations. Benzo(a)pyrene and benz(a)anthracene in air were not statistically related to carbon monoxide or lead in air, but were higher in winter than in summer, probably because of the higher levels of these materials emitted in space heating combustion in winter. (Author abstract modified)##

05008

New York State Air Pollution Control Board, Albany. (Feb. 1966.) 132 pp.

AIR POLLUTION/THE MID-HUDSON: ORANGE, ULSTER, ROCKLAND, COLUMBIA, DUTCHESS (COMPREHENSIVE AREA SURVEY REPORT NUMBER SIX).

A comprehensive study of the air pollution potential in the Mid-Hudson area was undertaken as a cooperative effort by the Columbia, Dutchess, Rockland, and Ulster County Health Departments, and the State Health Department's Orange's District Office (for Orange County) and Middletown District Office (for Beacon City). The objective of the study was to define the nature and extent, and causes and effects, of the air pollution potential in the Mid-Hudson area. Both industrial and nonindustrial air pollution were studied by conducting an inventory of possible air contaminant sources and determining contaminant emissions within each county. The inventory was supplemented by an atmospheric sampling network consisting of 41 stations located throughout the five counties.##

05009

New York State Air Pollution Control Board, Albany. June 1966. 35 pp.

AIR POLLUTION NASSAU COUNTY (COMPREHENSIVE AREA SURVEY REPORT NUMBER FOUR).

A comprehensive survey of local sources of atmospheric contamination was conducted by the Nassau County Department of Health in order to appraise the present status of and the potential for air pollution in the County. In defining the nature and extent of existing and potential air pollution, the objectives of this study were: (1) To provide information from which rules and regulations may be established for the control and abatement of existing air pollution in Nassau County; (2) To provide technical data needed to implement a practical and reasonable air pollution abatement program; (3) To assess the effectiveness of existing controls and determine what steps must be taken by governmental agencies to control both existing and potential air pollution; (4) To provide background data needed to check the effectiveness of any future control program; and (5) To obtain information for presentation to the State Air Pollution Control Board for use by the Board in establishing rules and regulations for control of air pollution as mandated by law. An inventory of air contaminant sources, an aerometric sampling network, and an investigation of complaints and air pollution effects were undertaken to obtain the data needed.##

05057

R. E. Eastwood, W. D. Smith, and J. E. Johnson

SUBMARINE ATMOSPHERE STUDIES ABOARD USS SCULPIN. Naval Research Lab., Washington, D. C., Chemistry Div. (NRL Rept. No. 6078.) Feb. 27, 1964. 27 pp.

Studies of the organic contaminants in the atmosphere of USS SCULPIN were made during a submerged cruise. Detailed analyses were made of the concentrations of methane, Freon-12, and "total hydrocarbons" by means of a backflush gas chromatograph of new design. The effectiveness of the CO/H2 burners and both carbon bed as removal agents for organic contaminants was included in the studies. The CO/H2 burners satisfactorily burned organic contaminants at temperatures as low as 500 degrees F. The active carbon in the main filter bed removed the higher hydrocarbons, but was not very effective for the removal of lower hydrocarbons and Freon-12. Based on experimental data obtained on shipboard, it was calculated that the rate of generation of organic vapor contaminants was about 1.5 pounds per day throughout the cruise. (Author abstract)##

05110

W. J. Hanning, R. D. MacPhee, and J. B. Taylor

CONTAMINANT CONCENTRATIONS IN THE ATMOSPHERE OF LOS ANGELES COUNTY. J. Air Pollution Control Assoc. 10, (1) 7-16, 93, Feb. 1960.

The primary purpose of this study was to analyze long-term pollution trends as measured by the Los Angeles Air monitoring network. Except for work in England on a distinctly different type of air pollution problem, there are few data available which span any appreciable number of years. The District's monitoring was accomplished with 24-hr recording devices. Its usefulness is justified primarily as a protection and warning measure. A by-product of this operation is the generation of data from which pollution can be studied. The findings may be summarized as follows: (1) During the three-year period, 1956-59, the general level of CO rose. The rise in CO of one ppm per year was not reconciled with weather or other pollution factors. The rise in NO2 was small and trends are available only from 1957. NO2 varied slightly without changing its general level. Particulates declined during 1956 and 1957 which could have been due in part to the District's incinerator ban. A preliminary study on the basis of comparable weather factors appeared to justify this conclusion. The oxidant, eye irritant, and plant toxicant declined in 1956 and 1957 from a high in 1955, but exhibited a slight upturn in 1958. Winds and inversions appear to the determining factors for trends in eye irritant, oxidant and plant toxicant. (2) In examining the monthly average data used as the basis for the trend lines, it was observed that certain contaminant and weather factors could be grouped together. Monthly averages for primary, or Type I factors exhibited annual peaks in midwinter. These were CO, hydrocarbons, NO2, particulates, SO2 (not perfect fit), frequency of morning surface inversions, and the inverse of 1600-1900 PST windspeeds. In addition, the Type I contaminants are known to yield bimodal diurnal variations. Secondary, or Type II, entities showed annual peaks in the autumn, and single daily peaks. These included aldehydes, eye irritant, oxidant, plant toxicants, ozone alerts, restricted visibility, the frequency of Rule 57 Days, and the inverse of 24-hr average windspeeds. Both the yearly and the diurnal cycles confirm the distinction between Type I and Type II contaminants. (Author conclusions modified)##

05916

C. R. Schuessa and C. W. Gruber

AIR QUALITY DATA-1956. Cincinnati Dept. of Safety, Ohio, Div. of Air Pollution Control and Heating Inspection. (May 1957). 33 pp.

The purpose of this report, published for the first time as a separate document by the Cincinnati Division of Air Pollution Control, is to summarize air quality levels of pollutants currently being measured in the City of Cincinnati, including: (1) measurements made wholly by this Division; (2) results of cooperative projects with the U.S. Public Health Service; and (3) summaries of Cincinnati air quality compared to other cities for certain pollutants. Tabular data are given for: dust fall (settleable particulates); soiling index; suspended particulates; wind-blown particulates; gaseous pollutants; and Southwestern Ohio-Northern Kentucky air pollution survey.##

05971

L. E. Hitchcock, W. L. Faith, R. Neiburger, R. A. Bencetti, and L. H. Rogers

AIR POLLUTION SITUATION IN LOS ANGELES - AN AEROMETRIC SURVEY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 12-23.

This paper summarizes the methods, the results, and some preliminary indications and conclusions employed in the survey. A major purpose of the survey was to monitor presumably important variables so as to provide a more adequate basis for diagnosis of the general problem. Pinto beans were used to measure the plant damaging effects of smog. Also measured were oxidants, nitrogen dioxide, hydrocarbons, carbon monoxide, aldehydes, sulfur dioxide, particulates, and meteorological factors. Some of the recommendations derived from the survey are that more complete meteorological measurements be obtained, that plant damage as a measure of smog be given more extensive study, and that a minimum of 18 monitoring stations be established in the Los Angeles Basin.##

05627

W. F. Scott, E. R. Stephens, P. L. Hanst, and R. C. Doerr

FURTHER DEVELOPMENTS IN THE CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at the Session on Air Pollution, 22nd Midyear Meeting, American Petroleum Inst., Division of Refining, Philadelphia, Pa., May 14, 1957.)

The technique of long-path IR spectroscopy is currently being used at the Franklin Institute both for direct studies of atmospheric pollution and for laboratory experiments. With the field instrument, concentrations of most of the important pollutants in the Los Angeles atmosphere were measured as a function of time and meteorological conditions. These studies supported the general picture of atmospheric pollutants and their reactions which was developed from laboratory studies both at The Franklin Institute and in other laboratories. Laboratory studies indicated the concentrations of NO and NO2 would be quite low in smog. The organic nitrogen compound, identified as peroxyacyl nitrite, was a prominent product in the laboratory studies, and it was predicted that this compound would be found in the smog. Both of these conclusions were confirmed by atmospheric analysis. The presence of ozone, long used as the primary smog indicator, was also confirmed. Air analyses for several major pollutants, made after sundown, showed a close similarity to an analysis of diluted automobile exhaust and to an analysis of air taken near a heavy traffic center. Several compounds whose presence in polluted air has been suspected were found to be below the limit of detectability. Among these were H2CO, HNO3 and CH3OH. Reaction products of O3 with olefins at low concentration (10 ppm to 50 ppm) were identified as aldehydes, CO, CO2, water, and, from propylene and 2-pentene, ketene. Other products of the reaction between O3 and the higher olefins were indicated. Yield of CO and CO2 indicated a definite connection between chain length and the decomposition of products. Several pure ozonides were prepared at low temperature, and their infrared spectra recorded. In some cases the decomposition products were determined.##

05652

Anderson, D. O., Williams, I. H., and Ferris, B. G., Jr.

THE CHILLIWACK RESPIRATORY SURVEY, 1963: PART II, ARSONETRIC STUDY. Can. Med. Assoc. J. 92, 956-61, May 1, 1965.

A study of the quality of the ambient air at Chilliwack, British Columbia, was conducted from May 1963 to April 1964. Measurements of dustfall, sulfation, hydrogen sulfide, oxidants and total hydrocarbons were made by a network of five sampling stations. The results of this survey indicated that Chilliwack was relatively free from any air pollution and would therefore be a suitable control for a study of the relationship between community air pollution and respiratory disease.

05675

G. J. Cleary and J. L. Sullivan

POLLUTION BY POLYCYCLIC AROMATIC HYDROCARBONS IN THE CITY OF SYDNEY. Med. J. Australia 52, 758-61, May 22, 1965.

General characteristics of atmospheric pollution and sources of polycyclic hydrocarbons in Sydney are briefly discussed. Air particulate samples were collected with high-volume samplers each month. These were extracted with acetone or cyclohexane, then developed on long alumina columns. The ultra-violet spectrum of each fraction provided the main criterion for qualitative identification, although fluorescence spectroscopy and paper chromatography were used to a minor extent. Quantitative analysis was made on the ultra-violet spectrum by means of the local base-line technique. Monthly concentrations of the hydrocarbons pyrene, fluoranthene, 1,2 benzanthracene, chrysene, 1,2 benzopyrene, 3,4 benzopyrene, 1,12 benzoperylene and coronene were reported. These showed a rise and fall cycle which paralleled the seasonal particulate density fluctuations. First-order correlation coefficients showed that the concentrations of each of the hydrocarbons measured were associated significantly with particulate density at the conventional probability level. The future contribution by petrol and diesel engine exhaust products to the pollution by polycyclic aromatic hydrocarbons in Sydney should become more important. Conversely, the contribution from coal combustion sources should decline progressively. (Authors' summary) 09

05819

H. Brava and A. P. Bass

APPROACH TO THE CHARACTERIZATION OF THE AIRBORNE ORGANIC MATTER (BENZENE SOLUBLE) IN THE ATMOSPHERE OF MEXICO CITY. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City June 11-15, 1961.)

An 52% of the neutral benzene organic fraction in Mexico City's airborne particles consists of aromatic compounds. A characterization of this material was made. High volume samplers

were used. Three different sampling sites were chosen in the area of Mexico City with variation in activities considered when these sampling points were selected, i.e. Tacuba station was located in a semi-industrial area; a downtown station in an area with great traffic density; and a station at the University City, near a residential zone. Over a year period Tacuba station was operated only 2 weeks a month, while the other 2 were operated simultaneously one day each month, in order to obtain comparative data between the three sampling sites. The exposed filters were afterwards treated with benzene in a Soxhlet apparatus for a period of eight hours; collected (benzene soluble) material was dried in a water bath and weighed. An idea of the amount of organic benzene soluble material found in the samples taken at the stations in 0.1 g/cu m was 212, 184, 81 for the downtown, Tacuba, and University City stations respectively. This table shows the average of simultaneous sampling carried out at the 3 stations. That the downtown area is the richest in its content of organic benzene soluble material in airborne particles is believed due to two factors: (1) traffic conditions; (2) buildings that screen or filter most of contaminants carried by prevailing winds coming from NE and NW. The highest concentration of organic benzene soluble material was found during the winter months. Comparison of the uv spectrum of the benzopyrene fraction (Mexico City) and benzopyrene spectrum reported by Sawicki indicate the presence of BaP in the analyses. Other polynuclear hydrocarbons found in the benzene soluble fraction in Mexico City's airborne particles were: fluoranthene, pyrene benzo(a)-anthracene, benzo(e)pyrene, benzo(g,-h,i)perylene, and coronene. The benzo(a)pyrene value found in the organic benzene airborne particles in Mexico City lies within the range expected for nonurban areas. The only large communities where similar hydrocarbon concentrations are found are cities where auto-exhaust fumes are the principal pollutants (Los Angeles, San Francisco). A clear correlation between direct solar radiation and the organic matter content (benzene soluble) in airborne particles in Mexico City was not evident.##

05695

L. J. Prouis, Jr.

THE RISING TIDE OF AIR POLLUTION. Connecticut State Dept. Health, Hartford 01 (3), (Mar. 1967). 10 pp.

The air quality measurements of cities in Connecticut are presented. A correlation between population and the average suspended particulates (micrograms per cubic meter), benzene soluble organics, and dustfall is given. It is demonstrated that the contamination of the atmosphere is directly proportional to the size of the community. An enabling act (SB4036) is presently under consideration in the 1967 General Assembly which would empower the Connecticut State Department of Health to develop air pollution regulations for inclusion in the Public Health Code of the State of Connecticut.##

06186

Gosta, A.

THE CONSTITUTION OF AEROCOLLOIDAL PARTICULATES ABOVE THE OCEAN SURFACE. Proc. Intern. Conf. Cloud Phys., Tokyo Sapporo, Japan, p. 42-46, 1965.

The composition of particulates in the submicron range over the ocean was investigated. An aerosol spectrometer and a special polished chrome slide impactor were used to sample the particles. The deposits were analyzed microphotometrically and with regard to thermal stability, by exposure to 70 C for 15 hours. Deposits on formvar screens were taken with both instruments for electron microscope studies. Samples were taken as far as 70 miles off the coast of Southern California. The samples are typically thermally unstable. The presence of organic compounds might explain this. Kelp leaves in sea water samples showed distinct foam formation. Air sampled above the agitated surface showed a prolific quantity of thermally volatilizable organics. Nebulized surface sea water samples showed a majority of liquid droplets and the absence of crystal formations; in 10 feet deep water samples, crystalline particles predominate. When the organics in the deposits were extracted with a clean solvent, the deposits' light scattering was substantially reduced to about the same level as by thermal exposure. The condensation pattern was also altered substantially. Electron photomicrographs indicated crystal formation only for particles larger than .7 microns, whereas the small sizes appear predominately amorphous.

06290

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control

WASHINGTON, D. C., METROPOLITAN AREA AIR POLLUTION ABATEMENT ACTIVITY. ((212))p., Nov. 1967. 18 refs.

From February 1967 to August 1967 the Public Health Service conducted a technical investigation in the Washington, D.C., metropolitan area to provide information that could form a basis for recommendations for abatement in accordance with the tenets of the Clean Air Act. The results are presented of the 1967 investigation and the methods, techniques, and procedures are described. In concert with cooperative regional and local agencies, an air quality network was established, an emissions inventory was conducted, extensive meteorological data were acquired, air pollution effects on vegetation and various materials were investigated, and special data processing and summarization techniques were developed. The boundaries for the activity conformed to the Metropolitan Washington Council of Governments' area which includes the District of Columbia; the Maryland counties of Montgomery and Prince Georges; the Virginia counties of Arlington, Fairfax, Loudoun, and Prince William; and the independent cities of Alexandria, Falls Church, and Fairfax.##

06304

S. S. Epstein

EFFECTS OF PHOTOSENSITIZING POLYCYCLIC ATMOSPHERIC POLLUTANTS ON SINGLE CELLS. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-60.)

Polycyclic aromatic hydrocarbons, some of which are carcinogenic, are an important class of atmospheric pollutants produced by pyrolysis of organic matter. In a large series of polycyclic compounds, a strong positive association has been demonstrated between carcinogenicity and photodynamic toxicity, measured by lethal sensitization of a ciliated protozoan, Paramecium caudatus, to the otherwise non-toxic effects of long-wave ultraviolet light. A simple photodynamic bioassay has been developed to provide a rapid but indirect measure of the carcinogenicity of organic extracts of particulate atmospheric pollutants attributable to polycyclic compounds. HASH samples of atmospheric particulates were collected from approximately 100 different sources in the USA, exemplifying a wide spectrum of urban and rural pollutant characteristics, and composited by site, extracted and fractionated by standard procedures. Photodynamic potency bears no relationship to atmospheric concentration of particulates, organics or derived fractions. For the aromatic fraction, which contains all the BaP present in the parent organic extract, photodynamic potencies are strongly and positively correlated with BaP concentrations. The high potency of basic fractions probably reflects their content of carcinogenic di-alkylated benz(c)acridines. Sub-fractionation of a large composite oxy-neutral fraction has suggested that its photodynamic activity is due to the carcinogenic (7H-benz(de)anthracene-7-one. In a limited study on the carcinogenicity of organic extracts of atmospheric pollutants from 6 urban sites, using the mouse neonatal assay, a positive association was found between carcinogenicity and photodynamic toxicity. These and related studies are being further pursued.##

06430

J. F. Shively and F. S. Zigenfritz

A SURVEY OF HYDROCARBON AMBIENT AIR CONCENTRATIONS IN MIDLAND, MICHIGAN. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-180.)

Ambient air hydrocarbon concentrations (reported as ppm of methane) were determined at the Midland location of the Dow Chemical Company at five sites during the years 1961 through 1966. Hydrocarbon concentrations as determined with a Beckman Hydrocarbon analyzer (Model 108) were correlated with wind direction and wind speed. Wind speed concentration data are presented in two groupings (0-7) and 8-25+) M.P.H. In addition to hourly average concentration data the paper demonstrates the benefit of also recording the hourly maximum instantaneous peak concentration as an aid in highlighting short losses or poor dispersive characteristics of vents. Interpretation and integration of individual site data clearly indicated the plant

areas contributing the major hydrocarbon losses. Hydrocarbon background level (non-plant) was established and found to be closely representative of urban air. Dow contribution to the city area was determined to be at a low but measurable level and to be relatively constant irrespective of wind speed. Comparison with survey data from other areas was made. (Authors' Abstract)##

06535

T. O. Carver, B. Bucove, V. G. Mackenzie, and A. N. Heller

AN APPROACH TO A SOLUTION OF AN INTERSTATE AIR POLLUTION PROBLEM. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 1964.)

A six-months study (1961-1962) of an air pollution problem in Lewiston, Idaho and Clarkston, Washington was made jointly by the Departments of Health of Idaho and Washington and the Division of Air Pollution, Public Health Service. Aerometric studies, meteorological conditions, materials damage, and emission inventories were evaluated and preliminary considerations of health effects were made. Socio-economic aspects via a public awareness study of air pollution in Clarkston, Washington are reviewed in terms of survey methodology and analysis. Complementary studies of an odor survey in both Lewiston and Clarkston are interpreted. The development of a number of joint recommendations to solve the immediate air resource management problem and allow for future economic growth in the valley is explored. (Authors' abstract)##

06701

NATIONAL AIR SURVEILLANCE NETWORKS CONTINUOUS AIR MONITORING PROGRAM (1966 DATA TABULATIONS AND SUMMARIES FOR CHICAGO, CINCINNATI, DENVER, PHILADELPHIA, ST. LOUIS, AND WASHINGTON, D.C.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (1968). 551 pp.

The Continuous Air Monitoring Program is the National Air Surveillance Network which operates six continuous monitoring stations in major cities throughout the country. The data tabulations in this booklet are summaries of hourly concentrations of gaseous pollutants and 3-hourly summaries of coiling index levels during 1966. Also enclosed is a brief summary of monthly means and maxima, and annual frequency distributions of data from all stations.##

06707

SUMMARY OF 1964-1965 AIR QUALITY MEASUREMENTS. 90th Congress ("Air Pollution--1967, Part 3 (Air Quality Act") Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, April 19, May 2-9, 9-10, 1967.) p. 1298-1306.

Air pollution surveillance activities conducted by the National Center for Air Pollution Control include a nationwide network of stations equipped for periodic measurement of suspended particulate matter and, in some instances, such gaseous pollutants as sulfur dioxide and nitrogen dioxide; a six-city network of

stations equipped for continuous measurement of several gaseous pollutants; and a relatively new network of stations designed to provide a general indication of effects of air pollution on various types of materials in interstate regions. Data from both the periodic and continuous air sampling stations are discussed.##

06760

M. Maruta

AIR POLLUTION IN NORTHERN KYUSHU. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4, (3) 35-45, July6 1966. Jap.

A preliminary investigation of air pollution in northern Kyushu was started in 1952 and studies on existing conditions have been carried out since 1959. The yearly and monthly amounts of dust fall and SO2 in the five wards of northern Kyushu are tabulated for 1959 through 1965. The results show decrease in dust fall (from 26.49 to 20.71 tons/sq. km./month) and in increase in SO2 (from 0.25 to 0.54 mg/100 cc/day). Tabulations of dust fall and SO2 are given for the industrial, business, and residential sections. The Fe2O3 present in red smoke has also been measured and averages between 2.0 and 3.6g/sq. m/month. Measurements of 3,4-benzopyrene and components of automobile exhaust such as CO, SO2, Pb, NO, and NO2 are also tabulated for the five wards.##

06788

(STUDIES OF AIR POLLUTION IN THE DEPARTMENT OF THE SEINE IN 1965. PART 3. CONDITIONS AT ORLY AIRPORT.) Etudes de Pollution Atmospherique dans le Departement de la Seine en 1965. Troisieme Partie. Operation "Aerodrome d'Orly." Laboratoire Municipal de la Prefecture de Police, Paris, France. (Rpt. 1966.) pp. 1-2, 9, 11, 13-7. Fr.

The results of an air pollution study made at Orly Airport at the request of the medical services at the airport are given. The survey covered the exposure to ground personnel and an investigation of the components of the fuel and emissions from jets. The investigation was conducted by a mobile air pollution laboratory located at the field during the study. In general, the pollution was negible, the emissions from the jets were not a matter of concern, but there was a nuisance hazard to workers on piston planes. The carbon monoxide was determined by infra-red absorption with an average reading recorded every 15 min. The averages ranged from 0.5 to 18 ppm. The other contaminants that were determined included carbon dioxide, nitric oxide, nitrogen dioxide, sulfur dioxide, aldehydes, lead, 3,4-benzopyrene, toluene, xylene, and benzene, and in all cases the results were much lower than those obtained in various stations in Paris. Both on the basis of analyses made on ambient air and on emissions from jets there is little evidence of air pollution at Orly Airport in Paris.##

06789

(STUDIES OF AIR POLLUTION IN THE DEPARTMENT OF THE SEINE IN 1965. PART 4. CONDITIONS IN THE LOOP OF THE SEINE.) Etudes de Pollution Atmospherique dans le Departement de la Seine en 1965. Quatrieme Partie. Operation Boucle de la Seine. Laboratoire Municipal de la Prefecture de Police, Paris, France. Apr. 1966. pp. 1-2, 5-7, 9-10, 13, 15-7, 21, 23. Fr.

The 1965 results are reported of a continuing study of the air pollution in the industrial region northwest of Paris which originated with complaints of the residents. Because of the low carbon monoxide content of the air no tests for that gas have been made since 1960. This work is based on an examination of the dust collected from 16 Owens gages located in the loop and, for comparison, 5 in Paris and 1 in Bievres. The amount of insoluble dust and the content of ash and 3,4-benzopyrene was determined. In the soluble dust, the sulfate, chloride, and calcium ions were measured. The results were reported as the dust fall on a surface of 100 sq m per month. The elimination of coal from two central power stations in 1965 compared to 1961-1963, which indicated some other important pollution source was responsible. Tables and charts show the values for the various components of the settled dust since 1959 and compare the results with samples taken in other areas.##

06806

Rozinyuk, Yu.P., and N. N. Ruchkovskii

CONTAMINATION OF AIR BY 3,4-BENZPYRENE AROUND CERTAIN INDUSTRIAL ENTERPRISES. ((Zagryaznenie 3,4-benzpirenom atmosfernogo vozdukha v rainonakh nekotorykh proizvodstvennykh predpriyatii.)). Hyg. Sanit. (Gigiena i Sanit.), 30(1):107-108, Jan. 1965. Translated from Russian.
CFSTI: TT 66-51033

Atmospheric pollution by 3,4-benzpyrene in the vicinity of certain industrial enterprises is reported. Samples were taken by the aspiration method, using the FPP-15 grade filter. In taking a single sample, about 2000 cu m air were passed through the aspirator. The deposit on the filter was extracted with petroleum ether. The samples were tested for 3,4-benzpyrene by fluorimetric spectrography and spectrophotometry. Considerable quantities of 3,4-benzpyrene were discharged of metallurgical and asphalt-concrete enterprises. Only traces of 3,4-benzpyrene were detected in the vicinity of agglomeration factories of ore-dressing plants, and this is probably explained by the technological conditions of agglomeration.##

06986

New York State Air Pollution Control Board, Albany.

AIR POLLUTION IN WESTCHESTER. 87pp. (Dec. 1965).

The industrial and nonindustrial air pollution potential of Westchester County, N.Y. were studied by conducting an inventory of possible air contaminant sources to determine

contaminant emissions. The inventory was supplemented by an atmosphere sampling network consisting of 23 stations located throughout the county. Recommendations were based on the findings from combined inventory and atmospheric sampling data. Unlike the heavily industrialized portions of the state, only 23% or 42,000 tons of Westchester County's air contamination comes from industrial sources while 77% or 140,000 tons of the total contamination comes from nonindustrial sources. Of this amount over 100,000 tons come from motor vehicle and other transportation sources. Thus in aggregate, more than 55% of the total air pollution comes from these transportation sources while 64,000 tons of approximately 35% comes from fuel used for heat and power. Approximately half of the fuel emissions, 10% of the total contaminants, are from industrial sources. This, along with the 6% contributed by industrial processes, accounts for industry's 23% of the total emissions.**

06960

CRITERIA FOR AIR QUALITY AND METHODS OF MEASUREMENT. World Health Organization, Geneva, Switzerland. (Rept. No. WHO/AP/21.) (Presented at the Inter-Regional Symposium, Geneva, Switzerland, Aug. 1961.) (Sept. 10, 1963). 20 pp.

An Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement was convened in Geneva from 6-12 August 1961. Twenty experts in the field of air pollution from 15 countries in the American and European Regions of WHO presented technical papers and participated in the discussions. The Symposium discussed the rationale for selecting air quality criteria in Member countries, the role of epidemiological surveys in establishing guides to air quality, and studies on effects indirectly related to human well-being, such as damage to vegetation, soiling of surfaces, and reduction in visibility. The Symposium also defined the areas in which further research is needed to produce data that will serve as a sound basis for establishing guides to air quality; the participants emphasized the need for agreement on methods of measurement that, even if not identical, yield comparable data. Topics discussed (1) General considerations; (2) Rationale for selecting air quality criteria; (3) Role of epidemiological and aerometric surveys; (4) Damage to vegetation, soiling of surfaces and visibility reduction; (5) Medical studies needed for the improvement of data relating to guides to air quality; (6) Needs for the standardization of methods of sampling and analysis of ambient air pollutants; (7) Need for international collaboration and agreement on air quality criteria and methods of measurement.**

06965

J. E. Yocom, J. A. Parrow, J. C. Nagyar, and E. R. Gagnon

AIR POLLUTION STUDY OF NEW BRITAIN, CONNECTICUT (SUMMARY REPORT). ((TRC Service Corp., Hartford, Conn.)) (Sept. 1966). 38 pp.

The City of New Britain Health Department conducted a survey of air pollution in the city. It was the purpose of the survey to develop information on the major sources of air pollution in the city and determine their geographical distribution, to collect data

on the general level of air quality in terms of several pollutants, and to measure meteorological conditions associated with the air quality measurements. The survey was started in October 1965 and was completed in July 1966. Air sampling and meteorological measurements were made concurrently over approximately a one month period in each of the 4 seasons. Between the winter and spring sampling periods several samples for suspended particulate matter were collected in the vicinity of suspected major sources of particulate matter. The source inventory was conducted throughout the entire survey period. The survey was designed to enable the Health Department to assess the need for an air pollution control program and to serve as the basis for developing such a program.##

06977

AIR RESOURCES IN THE MID-WILLAMETTE VALLEY. Mid-Willamette Valley Air Pollution Authority, Salem, Oreg. (Dec. 1966). 80 pp.

In October of 1965, a survey and sampling program was initiated to determine the quality of air within the five counties of Benton, Linn, Marion, Polk and Yamhill. Phase I of this survey was accomplished by location of major sources of air pollution, identification of amounts and kinds of pollutants and, with meteorological data, establishment of dispersal and disposition patterns of pollution. Sources of pollution in the Mid-Willamette Valley consist mainly of combustion of fuels for heat and power, process emissions, and industrial and community solid waste disposal practice. Other sources of lesser significance at this time include auto exhaust emissions and agriculture and forest management practices. Intermittent build up of suspended particulates occurs during inversion periods throughout the year. Any month of the year in Salem will see inversions two of every three mornings. In conclusion, the early findings in the study do not indicate the need for a crash program of air pollution control. There is a strong indication that unless a preventive program is initiated to cope with the expansion and growth of communities and industries, the quality of the air supply will rapidly deteriorate.##

07198

Y. Kawanami

AIR POLLUTION IN TOKYO. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(2):11-22 (July 1966). Jap.

A definition of smog is given as the restriction of visibility to less than 2 km in the city and vicinity, excluding the restriction by rain. Out of 158 days when smog occurred in Tokyo in 1965, 64 were caused by heavy fumes and 90 by mist or haze. The differences in times of occurrence of heavy fume-type smog and mist or haze-type smog is discussed. The yearly variation of the number of "smog days" is graphed indicating seasonal influences. Smog decreases in winter but increases in summer and fall. The current status of air pollution in Tokyo is also covered with respect to dust and soot fall, floating dust, sulfuric acid, nitrogen oxides, hydrocarbons, and lead compounds. Measurement of dust and soot fall in Tokyo began in 1955 and yearly variations are graphed through 1965. Dust fall reaches a peak between

February and May and then again in August and September. These peaks are related to the meteorological influence of strong winds in spring and large amounts of rain in spring and late summer. Therefore, July and December are considered the best times to investigate air pollution without meteorological influences. Lengthy discussion is given to daily and hourly variations of pollution peaks in urban, industrial, and suburban areas.##

07292

Grushko, Y. M.; F. P. Pikun, L. M. Shabad, T. I. Rukavishnikova, L. M. Zak, and O. M. Viasenko

A COMPARATIVE STUDY OF ATMOSPHERIC AIR POLLUTION WITH CARCINOGENIC SUBSTANCE (3,4-BENZPYRENE) IN IRKUTSK AND ANGARSK. Text in Russian. Gigiena i Sanit., 23(4):7-10, 1958. 8 refs. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 81-86, March 1960.
CFSTI TT60-21188

Most of the fuel consumed in Irkutsk is burned by boiler operated manufacturing and production plants and by residential heating installations at comparatively low temperatures, which results in an extensive emission of soot into the atmospheric air. In addition, the Irkutsk smokestacks are of insufficient height for proper dispersion. At the Angarsk electric heat station the coal is burned at 1100 deg., which results in the production of the minimum amount of soot. The boilers are equipped with electrostatic precipitators which remove 95% of the ash from the discharge gases, and the smokestack of the station is 120 m high. All the above aid in sharply reducing the atmospheric air pollution. It was thought that the content of 3,4-benzpyrene in the atmospheric air of Irkutsk and Angarsk may differ sharply. To determine the correctness of such an assumption snow samples were collected in 1956 at certain points in Irkutsk and in Angarsk which contained sedimented industrial smoke fall-out; these were studied for their content of 3,4-benzpyrene. The results indicated that the control measures instituted in the city of Angarsk proved adequate for the protection of the atmospheric air of the residential part of the city, especially as related to the prevention of dissemination throughout the city of carcinogenic hydrocarbons.##

07304

Ioel', L. I.; A. G. Sadovnikova, E. A. Soboleva, and D. Ya. Turets

THE QUALITY OF ATMOSPHERIC AIR IN THE VICINITY OF PETROLEUM REFINERY PLANTS. Gigiena i Sanit., No. 8:8-13, 1958. Translated from Russian by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 2, p. 175-180, March 1960.
CFSTI TT60-21188

The present study extended over 1947 - 1949. Air samples for the determination of hydrocarbons were collected in special 100 - 200 ml pipettes. Hydrocarbons were determined by the combustion

method and carbonic acid by the Meberg method. The sensitivity of the method was 0.01 - 0.02 mg of carbon per 1 liter of air. Qualitative hydrogen sulfide tests were made with lead acetate paper and quantitative by Khrustaleva's silver nitrate method. A maximum of 1 liter of air was aspirated through a microdrexeli absorber. The sensitivity of Khrustaleva's method was 0.0005 - 0.001 mg/l. Air samples were collected at production assemblies 1 - 4, 7 - 8, 45 and others throughout the plant. A subjective study was made by questioning 174 residents of the different community areas. Residents of the south and east settlements noticed the odor of petroleum becoming stronger when the wind blew toward the settlement. Residents of the upper residential area noticed the unpleasant odor only when the wind blew from the plant in the area. In the summer all had noticed a stronger odor of petroleum in the air; they complained that it was not possible to open the windows or ventilators for house airing. Residents of the south settlements complained of metallic objects tarnishing. It is recommended that working conditions in the plant be improved and pollution of the atmospheric air of the populated areas be decreased by instituting the following sanitary measures: install equipment for the removal of sulfur compounds from the petroleum; enforce prevention of gas leakage in manufacturing process; and sanitize surroundings by planting trees, shrubs and other greenery.

07366

Grafe, H. and H. H. Peters

RECORDING OF CO AND ITS DEPENDENCE ON TRAFFIC AND WIND. (CO-Registrierungen in ihrer Abhangigkeit vom Strassenverkehr und vom Wind.) Text in German. Stadthygiene (Celle/Hamburg), 15(6):129-134, June 1964. 8 refs.

At two locations in down-town Hamburg, CO measurements were made with the aim of establishing relationships between CO concentrations, traffic density, and wind velocity and direction. Three maps illustrate the general and detailed location of the sample points. The equipment used was the continuously recording UNAS-1-CO instrument of Hartmann & Braun. In six diagrams, daily and weekly variations of the CO concentration, their distribution function, and their dependence on wind direction and velocity are presented. While some influence of the buildings lining the street is noticed, the CO concentration is mainly a function of the traffic density. No relationship was found between the concentrations of CO and 3,4-benzopyrene. Increased CO concentration is accompanied by increased dust concentrations, probably stemming also from the exhausts.##

07393

K. Nakayama

PRESENT STATUS OF AIR POLLUTION IN CITIES AND TOWNS. Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc.) (Tokyo), 3(3):5-10, 1965. 12 refs.

A review of well-known air pollution episodes is given citing environmental conditions, damages, and causes for episodes in Meuse (Belgium) in 1930, Donora, Pa. in 1948, London in 1952, Mexico in 1950, Yokohama (Japan) in 1946,

and Los Angeles at present. The present problems of air pollution in Tokyo are dealt with including dust fall, SO2 concentration, floating soot, dust, and hydrocarbons. The average value of dust fall was 23.46 tons/sq km/30 days for 1959 to 1963; the soluble elements of soot fall were measured at 6.47 tons/sq km/30 days. The maximum was recorded in 1961; seasonal measurements indicate a maximum in February and a minimum in December. Yearly variations of the quantities of coal and petroleum used between 1955 and 1964 indicate a relation between dust fall and the amount of coal used, but no relation between the latter and petroleum consumption. The distribution of SO2 gas concentrations in 1964 as measured by the lead peroxide method is shown on a map of Tokyo. Hydrocarbon concentration of C2 to C8 compounds ranges from 15 ppb to 1.5 ppm. In heavily trafficked areas the concentration of 3,4-benzopyrene is between 1.3 and 5.6 micrograms/100 cu m. The effects of automobile exhaust from the gasoline engine are detected as high as 500 m. Also, water pollution from the Sumida river causes ammonia and hydrogen sulfide to be discharged into the air.##

07408

Viviot, P. and G. Dussarchey

STUDY OF THE AIR POLLUTION IN LYON DURING 1965. ((Etude de la Pollution de l'Atmosphere de Lyon (Annee 1965).)) Text in French. Pollut. Atmos. (Paris), 9(34):77-83, Apr.-June 1967.

The results obtained at various stations located in the Lyon area are detailed in charts, tables, and graphs to show the air pollution by month for SO2, dust, CO, CO2, unburned hydrocarbons as well as an analysis of the dust samples caught on a Teflon filter over the period of a month. The maximum SO2 for the year was found on Jan. 12 at Rossuet St. and showed 223 ppm compared to 510 in 1963. The average concentration during the winter for SO2 and dusts was 139 and 108 micrograms/cu. m., respectively, while the summer values were 34 and 16 micrograms/cu. m., respectively. On the 27th of July, no SO2 was found at 10 stations. Analytical methods are given for the various pollutants. The average Su Z concentration for Lyon was below that of Rotterdam and Paris. Paris from October to March has a much higher concentration than Rotterdam but is lower from April through October. Rotterdam is lower than Lyon in smoke concentration and Paris is about the same as Lyon with regard to smoke.##

07409

E. B. Robinson, J. E. Chambers, J. W. Bates

DEFINING THE PROBLEM OF AIR POLLUTION IN METROPOLITAN BIRMINGHAM, ALABAMA. Preprint, Jefferson County Dept. of Health, Ala.; (1933)) p.; June 1967. 15 refs.

The air pollution problem in Metropolitan Birmingham, Alabama is presented. The results and recommendations of previous and current studies of air pollution in Jefferson County are compiled. Possible methods of air pollution control are also discussed. The topography of the Birmingham

area is irregular, consisting of ridges with intervening valleys. The city proper is in a valley. The main climatic effect of the topography is that during winter months it produces extreme temperature inversions and rather low minimum temperatures. The range of annual averages of suspended particulate matter in the 10 station sampling network varied from 72 to 281 micrograms/cu. m. Results show that 20% of the time suspended particulate matter in Jefferson County exceeds 265 micrograms/cu. m. The annual averages for dustfall range from 9.5 tons/sq. mi./mo to 87.8 tons/sq mi./mo. Sulfation levels are generally rather low in Jefferson County. Sulfur dioxide levels are generally low year round with the winter season having the highest concentrations. Nitrogen dioxide was the only gaseous pollutant found in any significant quantities with the range of daily levels being 0.7 to 62.7 parts per hundred million. Daily aldehyde levels ranged from 0 to 4.0 parts per hundred million. Air pollution comes from four main sources: (1) Domestic, (2) Transportation, (3) Commercial and (4) Industrial. Stationary sources include the domestic, commercial and industrial. Industrial sources account for approximately 98% of the particulate emissions, 80% of the gaseous emissions and 51% of the hydrocarbon emissions from stationary sources. In comparison with stationary sources transportation contributes only slightly to the particulate matter. The results of the public opinion survey showed that 50% of the people within the City of Birmingham and an average of 42% of the people outside the city limits were annoyed or affected adversely in some way by air pollution.##

08161

V. I. Shvarts, L. A. Zil'berg

ZONAL STUDY OF ATMOSPHERIC AIR POLLUTION IN AREAS SURROUNDING A ROOFING TAR PAPER PLANT. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by D. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech.; Vol.; 3, p. 105-108, May 1960.
CFSTI; TT 60-21475

Determinations were made of the content of dust, hydrocarbons, and sulfur dioxide in the vicinity of a roofing tar paper plant. Air samples were collected on the windy side, and 2.5 m above the ground on all sides of and at different distances from the plant. Hydrocarbons were determined by the combustion method; sulfur dioxide was determined nephelometrically; and dust was determined gravimetrically. Carbon dioxide determinations were made in 11 air samples collected at 50 m from the plant. The concentration of carbon dioxide varied between 0.048 - 09302 mg/l of air. Hydrocarbon concentrations varied between a trace to 0.15 mg/cu m; SO2 varied between 1.25 and 5.59 mg/cu m. To obtain more accurate results with reference to the basic source of air pollution, 8 additional laboratory analyses were made of air samples collected 1.5 km from the plant at a point far away from industrial establishments. Sulfur dioxide concentrations varied between 0.0012 - 0.0015 mg/l; and dust concentrations varied between 1.05 and 1.12 mg/cu m. This was taken as evidence of the fact that air pollution in the vicinity of the plant was caused by the emission of gases and by the dust coming from the plant.##

08196

Romanova, V. A.

SANITARY CLEARANCE ZONES BETWEEN RESIDENTIAL SECTIONS AND PLACES OF FUEL STORAGE IN SOVKHOSES OF SARATOVSK (OBLAST) TERRITORY. Gigiena i Sanit., 23(6):11-14, 1958. 3 refs. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 188-192, Aug. 1960.
CFSTI: TT 60-21911

The mechanization of agriculture in the Soviet Union is accompanied by the proliferation of centers where automotive agricultural machinery is housed and fuel for the machinery is stored. The prescribed 75 m wide sanitary clearance zone between residential sections and fuel storage centers was evaluated for effectiveness in protecting residents from gasoline fumes and automotive emissions. Tetraethyl lead and hydrocarbons were measured in air and soil at varying distances from the gasoline storage tanks. It was concluded that a sanitary clearance zone of 75 m was inadequate.##

08198

Stankevich, N. E. and N. I. Isaeva

SELECTION OF AIR INTAKE POINTS FOR VENTILATION OF PREMISES IN PETROLEUM PROCESSING PLANTS. Gigiena i Sanit., No. 8:27-34, 1958. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 5, p. 202-208, Aug. 1960.
CFSTI: TT 60-21911

Previous investigators had concluded that even under most unfavorable conditions of refinery building location with regard to hydrogen sulfide accumulation, the air intakes located 10 - 20 m above the ground could supply air sufficiently pure for practical ventilation. In an effort to disprove this conclusion, studies were made at two petroleum refineries. Air samples taken simultaneously at 5, 10 and 15 m above the ground were analyzed for the content of hydrogen sulfide, hydrocarbons, carbon monoxide and sulfur dioxide. It was found that the installation of air intakes at 15 - 20 m fails to improve the quality of ventilation air, and in many cases might worsen it. In view of the complexity and specific conditions which may exist in some modern oil refineries, the choice of necessary sanitary measures can be made only on an individual basis by taking into consideration actually existing conditions.##

08199

Nagy, John A. and Ascon, R.

VEHICULAR POLLUTION EFFECTS IN URBAN DEVELOPMENT. Proc.Am. Soc. Civil Engrs., J. Urban Planning Develop. Div., 93(UP4): 231-241, Dec. 1967. (Presented at the American Society of Civil Engineers Transportation Engineering Conference, Philadelphia, Pa., Oct. 17-21, 1965.)

Toxic emissions from motor vehicles such as carbon monoxide, hydrocarbons, and nitrogen oxides in urban areas were measured. The tabulated results indicate that operation of large numbers of motor vehicles cause high concentrations of these contaminants in the urban atmosphere. The direct relationship between emissions and atmospheric concentrations is found in localized situations as well as community-wide air pollution. The quantity of exhaust contamination emitted can be related to traffic patterns and vehicle operating modes. Stop and go driving results in more pollutants than unimpeded flow. The present approach to a reduction of motor vehicle emissions, which is based mainly on engine modification and the use of control devices, is not sufficient. Additional benefits can be obtained through highway design, mass transit, and urban planning.

00115

Bosco, G. and Grella, A.

DETERMINATION OF AROMATIC POLYCYCLIC HYDROCARBONS IN THE HART ATMOSPHERE OF SIENA, ITALY. (Determinazione di idrocarburi policiclici aromatici nel pulviscolo atmosferico della citta di Siena.) Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), 17(4):297-300, 1966. 10 refs.

Data concerning occurrence and quantitative determination of polynuclear aromatic hydrocarbons in the air of Siena, Italy, from February through June, 1965 are reported. The data are tabulated for fluorene, phenanthrene, anthracene, pyrene, fluoranthene, 1,2-benzanthracene, chrysene, perylene, 3,4-benzopyrene, 1,12-benzanthracene, anthanthrene, and coronene. As units up to 5 micrograms/100 cu.m. of air were determined using hi-volume air-samplers which were placed 2 to 10 meters above the ground in five locations.

00122

Haatsch, Siegfried and Irwin Lehmann

CONCENTRATIONS OF HYDROCARBONS IN THE AIR OVER URBAN STREETS AND THEIR RELATION TO THE OCCURRENCE OF CARBON MONOXIDE. ((Kohlenwasserstoff-Konzentrationen in Strassenluft und ihre Relation zum Auftreten von Kohlenmonoxyd.)) Text in German. Erdoel Kohle (Hamburg), 20(9):642-643, Sept. 1967.

Continuous measurements of hydrocarbon and carbon monoxide levels of the ambient air were conducted alongside a Berlin street with high traffic density for several months. Hydrocarbons were measured with a flame ionization detector and carbon monoxide with an infrared analyzer. About 2,000 half-hourly average values and the daily average value were determined. The mean hydrocarbon concentration was dependent on the density of the traffic, reaching 7 ppm during the afternoon peak. Maximum value of total hydrocarbons was 14.2 ppm. Seventy percent of the values were in the 3 - 6 ppm range and 1% exceeded 10 ppm. The carbon monoxide and hydrocarbon concentrations were directly correlated showing a linear relationship, the average daily coefficient of correlation being 0.88. The mean absolute concentration of carbon monoxide was three times higher than that of the hydrocarbons.##

08485

Masuk, Vaclav

THE EFFECT OF SOLAR RADIATION ON THE PRESENCE OF 3,4-BENZOPYRENE IN INDUSTRIAL EXHAUSTS. [Vliv slunecniho zareni na pritomnost 3,4-benzpyrenu v exhalacich.] Text in Czech. Chem. Prumysl (Prague), 17(2):99-103, 1967. 30 refs.

The determination of polycyclic hydrocarbons in industrial exhausts and in the atmosphere has become increasingly important in recent years. The main interest is focussed on carcinogenic substances, particularly on 3,4-benzopyrene. In the present study, 3-4-benzopyrene was determined from samples obtained by passing air through filter paper in the vicinity of a coking plant in which coal tar products formed during carbonization leak into the atmosphere. At the same time the intensity of solar radiation was recorded with a Robitzsch pyranograph. The results showed that the intensity and duration of solar radiation had no effect on the content of 3,4-benzopyrene in the atmosphere and in the dust in the vicinity of the source. The discharge of tar products into the atmosphere must be controlled by changing the technology, e.g. by improving equipment seals and using steam injection to reduce the vapor pressure inside the equipment. Tables and graphs.##

09117

Alvisatos, G. P.; N. N. Hasan, J. Alexopoulos, and E. Vorykokakis

AIR POLLUTION IN THE CITY OF ATHENS AND SURROUNDING TERRITORY. L'Igiene Moderan, 60(1-2):3-25, Jan.-Feb. 1967. 42 refs.

Air pollution in Athens is discussed with emphasis on emission sources, population density, and city planning. An air sampling survey, conducted from mid-1962 to the early part of 1966, is described. The survey concentrated mainly on determining the amounts of smoke, SO2, CO, dust particles, dustfall, and polycyclic aromatic hydrocarbons. The results are tabulated. It is concluded that no immediate health hazard exists from air pollution in Athens because it is a windy and dry area. Recommendations are made to avoid hazardous air pollution in the future.##

09209

Schuenemann, J. J.

ASSIGNMENT REPORT, AIR POLLUTION TEHERAN. AN INTRODUCTORY SURVEY OF THE PROBLEMS AND SOME SUGGESTED ACTIVITIES. World Health Organization, Geneva (Switzerland), 49p., Sept. 13-Oct. 1, 1965. 3 refs.

A project was begun in the city of Teheran which consisted of these two parts: 1. A short term study of the main recognized sources of air pollution in the city with the aim of identifying their causes and recommending appropriate technical and administrative measures for their abatement. 2. A long-term

small scale study of air pollutants and their effects on the community with the aim of training staff and developing techniques for more intensive future studies. Information corresponding to these two parts is presented.##

09766

Moberg, J. L.

ANALYSIS OF TRACE CONTAMINANTS IN CLOSED ECOLOGIC ATMOSPHERES. Aerojet-General Corp., Azusa, Calif., Proj. 7930, Task 793002, NAR-TR-66-99, 17 p., Dec. 1966.
CFSTI, DDC: AD 647618

A 27-day experiment designed to determine man's contribution to trace contaminants in a sealed environment was conducted. The use of cryogenic fractionation and concentration provided samples with sufficient levels of contaminants for analysis by means of gas chromatography and mass spectroscopy. Large numbers of aromatic and aliphatic hydrocarbon compounds were detected in the samples. Alcohols, aldehydes, organic acids, esters, ethers and ketones were detected in smaller quantities.

09916

Bosco, G.; G. Barsini, A. Orelia

NEW STUDIES ON THE PRESENCE OF AROMATIC POLYCYCLIC HYDROCARBONS IN THE ATMOSPHERIC DUSTS OF THE HISTORIC CENTER OF THE CITY OF SIENA. ((Nuove indagini sulla presenza di idrocarburi policiclici aromatici nei polviscolo atmosferico del centro storico della citta di Siena.)) Text in Italian. Nuovi Ann. Igiene Microbiol. (Rome), 18(4):285-292, July-Aug. 1967. 10 refs.

Air at three locations in the center of town was sampled daily from Sept. 1965 to June 1966 using a high volume sampler. Particulate residues deposited on the filter paper were then analyzed for the presence of aromatic hydrocarbons. Data are tabulated and are considered of interest due to the closing of this part of town to all private traffic. Phenanthrene, anthracene, pyrene, methylpyrene, fluoranthene, 1,2,-benzanthracene, chrysene, perylene, benzopyrenes, benzofluoranthenes, anthanthren, 1,12-benzoperylene, 1,2,5,6-dibenzanthracene and coronene are found in amounts ranging from traces to 10.85 microgram/100 cu m. Highest values are generally observed during December and January. Domestic heating is mentioned as a source of the hydrocarbons.

11015

Tanisura, Hisashige

BENZO(A)PYRENE IN AN IRON AND STEEL WORKS. Arch. Environ. Health, 17(2):172-177, Aug. 1968.

To investigate benzo(a)pyrene in an iron and steel works, separating and measurement methods were studied, and amounts of benzo(a)pyrene contained in suspended and falling particulates were collected in the plant and measured for summer and winter sessions.

The samples were separated chromatographically and the amounts were determined spectrophotometrically. A great amount of benzo(a)pyrene was found near the three high mills in the rolling mill plant, the coke oven, the blast furnace, and the electric furnace. High correlations were found between benzo(a)pyrene in suspended and falling particulates. (Author's abstract)##

11226

Vanecia, B. and G. Ozolins

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. II. AIR POLLUTANT EMISSION INVENTORY. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 50p., Dec. 1966. ((50)) refs.

An emission inventory was conducted during 1963-1966 as part of the St. Louis - East St. Louis Interstate Air Pollution Study. The Study covered an area of 1,547 square miles and included the City of St. Louis and the six surrounding counties - St. Louis, St. Charles, and Jefferson Counties in Missouri and Madison, St. Clair, and Monroe Counties in Illinois. More than 95 percent of the population and almost all of the industrial activity are located in the 400 square miles of the centrally located urbanized part of the Study area. The pollutant emission data presented can be almost entirely attributed to this urbanized portion of the area. Population density and land-use maps, which provide an excellent index to the areal distribution of most pollutant emissions, are presented. The pollutants considered in this survey are those emitted in large quantities from a variety and multitude of sources dispersed throughout the area. Included are aldehydes, carbon monoxide, hydrocarbons, nitrogen oxides (calculated as nitrogen dioxide), sulfur oxides (calculated as sulfur dioxide), particulates, and benzo(a)pyrene. The emissions of other pollutants are generally associated with a specific process or operation and in general, are not distributed throughout the community. (Authors' abstract, modified)##

11267

Public Health Service, Cincinnati, Ohio, Div. of Air Pollution.

FOUR-YEAR SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM.
Preprint, ((23))p., Aug. 1966.

Continuous air monitoring data gathered during 1962 - 1965 is summarized. Ambient atmospheric concentrations of six gaseous air pollutants from several major American cities are given. These include sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monoxide, and soiling index values. Summaries by city and year are given of the annual average concentrations, the maximum and minimum monthly average concentrations, and the maximum daily average concentration of the several pollutants monitored.##

11572

Kutscher, H. and H. Tosingas

STUDY OF THE HAZARDS PRESENTED BY SOOT AND AIR DUST WITH PARTICULAR EMPHASIS ON THEIR CARCINOGENIC ACTION. - PART 10 - DUST MEASUREMENTS BY MEANS OF THE TH-II APPARATUS AT A BUSY SECTION OF HEIDELBERG. ((Untersuchungen uber die Schadlichkeit von Russen und Luftstauben unter besonderer Berucksichtigung ihrer kanzerogenen Wirkung.)) Text in German. Arch. Hyg. Bakterol., 152(3):260-264, June 1968. 3 refs.

In July 1967 (a very hot month, free of precipitation), 10 measurements were made at a busy intersection of Heidelberg, Germany. The findings revealed that the amount of dust in the air was more than 1 mg per cubic meter which, by any standards, is extremely high. Evaluation of various factors suggested that automobile exhaust was largely responsible for this high degree of air pollution. The interesting feature of the present study is that the size of dust particles collected during measurements is compatible with their deep penetration in the respiratory tract. Particles as large as 50 microns were seldom encountered, most of the dust grains being slightly larger than 10 microns. Chemical analysis revealed that the amount of benzo(a)pyrene varied between 37 and 97 micrograms per cubic meter of air.##

11577

Univ. Liege, Belgium, Lab. Toxicology and Hygiene

SURVEYS PERFORMED IN BELGIUM. POLLUTION BY EFFLUENTS OF COMBUSTION IN AN URBAN ZONE WITH HEAVY POPULATION DENSITY. ((Enquetes realisees en Belgique. Pollution par effluents de combustion en zone urbaine a forte densite de population.)) Text in French. Organization for Economic Co-operation and Development, Paris, France, 4p., (1967) 3 refs.

As part of a continuing study of the effects of air pollution in the vicinity of Liege, a qualitative and quantitative evaluation of the pollutants from a charcoal compressing factory on the northeast outskirts of the city are reported. The neighborhood is mixed residential and contains a school, a sport field, an exhibition hall, and a railroad line. The factory produces 60 tons of processed coal per hour, is sealed, and equipped with electrostatic filters. The indicators were settling particles and suspended particulates. The factory began operating in April 1960 and the monitoring began in December 1959 and continued through April 1961. The sites are described for each pollutant and the methods of determination listed. The results are not given in detail (they may be in graphs which are not included with the document). The emissions were exclusively carbon and tars. Some methods of determination were found to be more reproducible than others. Flourescence was a specific indicator for the presence of polycyclic hydrocarbons in the settling particles.##

11579

Univ. Liege, Belgium, Lab. Toxicology and Hygiene

SURVEYS PERFORMED IN BELGIUM. POLLUTION BY EFFLUENTS OF COMBUSTION IN AN URBAN ZONE WITH HEAVY POPULATION DENSITY. ((Enquetes Realisees en Belgique. Pollution par Effluents de Combustion en Zone Urbaine a Forte Densite de Population.)) Text in French. Organization for Economic Co-operation and Development, Paris, France, 4p.; (1967) No refs.

Air pollution measurements by continuous monitoring were carried out between 1962 and 1965 in Liege, a city of 150,000 inhabitants/25 sq. km. situated in the center of an industrial area of 500,000 inhabitants/90 sq. km. in the Meuse Valley. The weight of respirable suspended particles (permanent pollution) in the air was estimated by spectrophotometry while polycyclic hydrocarbons were obtained by column chromatography and spectrophotometry, or by chemical extraction. Particulate residues induced by fumes (industrial and vehicular) amounted to 0.1 mg/cu m in the center of the agglomeration and 0.07 mg/cu m in the suburbs and high grounds. In wooded sites and in industrial areas permanent pollution amounted to 0.05 mg/cu m and 0.13 mg/cu m, respectively. The general increase (40%) of pollution observed during the winter months was caused by the continual use of combustibles for domestic heating and was higher in the suburbs. Wind velocities of more than 15 km/hr reduced permanent pollution to 0.5 mg/cu m at all sites, while temperature inversion increased pollution 2-3 times the seasonal average. The concentration of polycyclic hydrocarbons increased 5-10 times during the winter and was directly related to temperature. The concentration of polycyclic hydrocarbons per weight unit of permanent pollution changed according to site and season, indicating the varied nature of the samples collected.##

11918

L. N. Gasciovich, and Yu. N. Nedkin

AIR POLLUTION WITH 3,4-BENZPYRENE FROM PETROLEUM AND CHEMICAL INDUSTRIES. ((Zagryaznenie atmosfernogo vozduha 3,4-benzpirenom predpriyatiyami neftekhimicheskoi promishlennosti.)) Text in Russian. Gigiena i Sanitariya, 33(9):10-14, Sept. 1968. 7 refs.

The 3,4-benzpyrene concentrations of 193 air samples from 2 petroleum refineries, one chemical plant, and the city of Grozny, collected for 3 years by an RAV-49 aspirator and adsorbed on the organic FPA-15 tissue, were determined after extraction with benzene and dilution with n-octane. The refineries had 0.1-40 mkg micrograms/100 cu m (with values of 0.8-40 mkg/100 cu m in coke shops), the chemical plant (pyrolysis shop) 0.9-9.1 mkg/100 cu m, and the city sections (distance 50-2000 m from a contact coke plant) 0.08-0.40 mkg/100 cu m maximal 3,4-benzpyrene concentrations. The emission was the highest during full-capacity production, with 2-6-fold increase in a contact coke plant of refinery No 2. By order of the city sanitary physician refinery No2 was closed down temporarily. The furnaces were supplied with gas-forming fuel and hermetization was carried out. It was concluded that within a 2-km radius from a petroleum refinery, there is considerable 3,4-benzpyrene pollution. The most significant sources were the coke and pyrolysis shops.##

13040

Cavanagh, Leonard A., Conrad F. Schadt, and Elmer Robinson

ATMOSPHERIC HYDROCARBON AND CARBON MONOXIDE MEASUREMENTS AT POINT BARROW, ALASKA. Environ. Sci. Technol., 3(3):251-257, March 1969. 12 refs.

The concentrations of low molecular weight hydrocarbons and carbon monoxide in uncontaminated Arctic air masses were analyzed at Point Barrow, Alaska. Using gas chromatographic techniques, a variety of organic compounds were regularly observed in these air masses, and the following average concentrations were obtained: methane, 1.6 ppm; butane, 0.06 ppb; acetone, 1.0 ppb; and n-butanol, 190 ppb. Carbon monoxide concentrations averaged about 90 ppb. Special investigations confirmed the unexpected presence of n-butanol in these samples. Sources of these organics are postulated. (Author abstract)

13788

Ingiulla, M., C. Grasso, and E. Mariottini

USE OF HYDROCARBONS LEVEL DETERMINATIONS IN THE STUDY OF AIR POLLUTION. (Ulteriori determinazioni dell'ossido di carbonio quale indice di inquinamento atmosferico). Text in Italian. Igiene Mod. (Parma), 61(9-10):582-591, Sept.-Oct. 1968. 3 refs.

Air pollution in Florence was studied by determining concentration levels of carbon monoxide in 1296 air samples and hydrocarbons in 1108 samples. Samples were taken in busy streets and adjacent shops or apartments. The CO concentrations reached levels as high as 150 ppm outdoors and 50 ppm in a shop, indicating notable air pollution. Hydrocarbon levels were too small to be determined. (Author summary modified)

14100

Gordon, Robert J., Henry Mayrsohn, and Raymond H. Ingels

C2-C5 HYDROCARBONS IN THE LOS ANGELES ATMOSPHERE. Environ. Sci. Technol., 2(12):1117-1120, Dec. 1968. 12 refs.

A joint study was carried out in Los Angeles in the fall of 1967 to define more closely the actual concentration of oxides of nitrogen and various hydrocarbons in the atmosphere on days of differing smog intensity. Part of the study involved gas chromatographic analysis for light hydrocarbons, ethane to isopentane, at two sites. Almost 700 samples were run during 46 days. Averages were presented for the hourly samples subdivided into groups of high or low oxidant development. Light paraffins, especially propane, were found in concentrations too high to be ascribed to auto exhaust, but their source was not pinpointed. The average morning concentration of oxidant at various locations was closely similar, hour by hour, in spite of large differences in the levels of primary pollutants. The ratios of acetylene and high olefins to nitrogen oxides were found to be higher than the average in exhaust generated in a test cycle on a dynamometer.

14539

COMMISSION ON EARTH, WATER AND AIR, ROTTERDAM. Annual Report 1968. (Verslag over het jaar 1968). Text in Dutch. 72p.

This report deals with the soil, water, and air pollution problems in the vicinity of Rotterdam. Thirty-three cases of soil pollution reported in 1968 were mainly due to leakage in underground tanks and pipes. The average chlorine content at low tides at the measuring station of the Horingerdijk reservoir was 139 mg/l, 7 mg/l lower than in 1967. The level of air pollution during 1968 was more or less constant in comparison with 1967. A study of the 1318 bronchitis complaints of male civil servants indicated that bronchitis occurs with increasing frequency in the age group above 40 and especially above 60. A study of chronic bronchitis and asthma in elementary school children in two sections of Rotterdam indicated that in Crooswijk, 5.5% of 655 children had chronic bronchitis and 2.2% had asthma. In Hillegersberg, 1.0% of 980 children had chronic bronchitis and 1.7% had asthma. Measurements of precipitation, smoke, polycyclic hydrocarbons, CO, ozone, SO_2, and sulfur oxides are presented. The smoke meter results show a usual smoke content of 100 micrograms/cu m or more during long periods of mist which occur during the winter months. In the first and fourth quarters, the polycyclic hydrocarbon values were much smaller than those of 1964. Of 174 samples of carbon monoxide, 18 were more than 30 ppm; in 1967, only one sample was higher than 30 ppm. The highest lead content was 1.5 micrograms/cu m. Ozone content of the air was less than 20 micrograms/cu m on cloudy days. Nitrogen oxide concentration ranged from 100-150 micrograms/cu m. Ninety-one days were recorded with SO_2 content equal to or greater than 350 micrograms/cu m, and 39 days were recorded with smoke content equal to or greater than 250 micrograms/cu m. The declining tendency for smoke pollution was attributed to the increasing use of natural gas.

14616

Commission on Earth, Water, and Air, Rotterdam

REPORT ON THE YEAR 1967. (Verslag over het jaar 1967). Text in Dutch. 128p.

The Commission on Earth, Water and Air Pollution, Rotterdam, is composed of engineers and scientists from various municipal commissions and public service departments. It works closely with other municipal groups and industrial associations to regulate pollution in the area around the south of the Rhine, collaborating on guidelines for municipal ordinances and emission standards. The commission operates an extensive measurement network and maintains laboratory facilities for the chemical analysis of pollutants. One of its purposes is to compile a report of all public and private activities relating to combating the pollution of earth, water, and air. This report for 1967 surveys the reduction in pollution effected by measures undertaken by municipal power operations, municipal plants, and private industry in the Rotterdam area; control methods still under study; sources of water pollution; complaints about the dispersion of unpleasant odors, smoke, soot, and fog; the possible relation between air pollution and bronchitis in municipal employees and school children; results of atmospheric measurements; and the preparations for a national environmental hygiene literature pool. In 1967,

pollution caused by smoke, sulfur dioxide, and polycyclic hydrocarbons continued to decrease, indicating that conditions imposed by authorities and efforts made by industries were largely successful. Measurement data and meter readings are tabulated. Maps of the measurement network are included.

14776

Lehmann, Erdwin

STUDIES OF AIR POLLUTION CAUSED BY MOTOR VEHICLES. (Untersuchungen ueber Luftverunreinigungen durch den Kraftverkehr). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 28, 80p., 1969. 123 refs.

A measuring station for determining the content of air pollution caused by motor vehicles was erected in front of the city hall in West Berlin, considered to be the busiest point in the city. The Uras infrared analyser was used for continuous measurement of CO and CO2 concentrations 75 cm above the ground; ozone was continuously measured at 2 and 20 m with a unit developed by Hasenchke und Luebke based on liberation of bromine from a potassium bromide solution by ozone. For continuous measurement of hydrocarbons at 75 cm, a Beckman 109A analyser was used. Discontinuous sampling was employed for measurement of SO, SO2, formaldehyde, and phenols. A high volume sampler was used for determination of the total dust concentration. Traffic counts were conducted throughout the measurement period, and the driving cycles were determined. The results are listed in detail in numerous tables and diagrams. The influence of meteorological factors such as wind direction and speed, humidity, temperature, and pressure is discussed. The maximum half-hourly average CO concentration was 60 ppm with concentration peaks in the morning and afternoon rush hours. Maximum CO2 concentration was somewhat less than 500 ppm and thus only 50% higher than the natural CO2 concentration of the atmosphere. No dangerous ozone concentrations were measured. All NO2 concentrations were below 0.2 mg/cu m. Peak SO2 concentrations occurred in between rush hours, which indicates that they are due to domestic heaters. A linear relationship between the various pollutants was found. The results of these measurements are compared with results in the literature.

14879

Tanimura, Hisashige

STUDY ON THE RELATION BETWEEN BENZO(A)PYRENE OF THE SUSPENDED MATTERS AND THAT OF THE FALLING MATTERS IN THE ATMOSPHERE. (Taikichu no fuyujin to rakkajin chu no Benzo (a) pyrene ryo no kankei ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), vol. 21:269-278, 1966. 31 refs.

Suspended and settling particulates were collected in industrial and residential urban districts in the city of Kita-Kyushu in the summer and winter from 1964-1965 and analyzed for benzopyrene. Suspended and settling particulates were collected at similar times and places and the relationship between benzopyrene in suspended particulates and settling particulates was determined. The results showed a high correlation between

benzopyrene in suspended and settling particulates in both seasons and in similar places. In suspended and settling particulates, benzopyrene in industrial urban areas was greater in the winter and was always greater than in residential areas. (Author abstract modified)

19705

Franco, P. and C. De Pospeis

INQUIRY INTO ATMOSPHERIC POLLUTION IN THE CITY OF PESCARA. (Indagine sull'inquinamento atmosferico nella citta' di Pescara). Text in Italian. Igiene Sanita Publica (Rome), 24(11-12):550-567, Nov.-Dec. 1968. 29 refs.

This Italian city of 120,000 inhabitants and 20,703 motor vehicles has light to medium industry, relies heavily on tourist trade from surrounding resorts, is the fastest-growing city outside Rome, and is intersected (rather than by-passed) by the Adriatic national highway. Homes are heated, mostly with heavy naphtha, from early November to late March. Fifty percent of approximately 1000 home heating plants lack official approval. No central facility for burning trash is provided. In May 1967 and April-June 1968, the air was tested at 13 critical points with Dreager 19/11 gas detectors, located 1-1.70 m above street level, for the presence of CO, CO2, SO2, hydrocarbons, and the nitrogen oxides, from 8:30 to 12 a.m. and 7-9 p.m. Carbon monoxide was detected at six points; at one point, where crossroads and Adriatic highway traffic met, the concentration was 100 ppm. Sulfur dioxide was detected at two points. Practical proposals were made; better placement of bus stops, timed traffic lights, installation of air purifiers, possibility of more electrically driven public transport, education of motorists in 'anti-pollution' driving habits, and use of larger zones of vegetation in congested areas. The authors feel that confinement of Pescara's expansion to the seacoast has been salutary and they oppose future expansion into the hilly inland region, because such expansion would promote more severe air pollution problems.

19697

Hilst, Glenn R., John E. Yocum, and Norman E. Bowne

THE DEVELOPMENT OF A SIMULATION MODEL FOR AIR POLLUTION OVER CONNECTICUT. VOLUME I. (SUMMARY REPORT.). Travelers Research Center, Inc., Hartford, Conn., Grant PHS-67-4, 66p., Oct. 1967. 3 refs.
CFSTI, DDC: PB 183 608

A working, computer-oriented simulation model of the state-wide Connecticut air pollution system was developed. This simulation model is designed to estimate the cumulative air pollution loading of Connecticut's atmosphere with a spatial resolution of one mile and a time resolution of one hour. Any arbitrary distribution of the air pollution sources can be evaluated with regard to resultant air quality over the region. As a management tool for evaluation of alternative air pollution control practices, this model provides an unprecedented information and evaluation system. In addition to the construction of this very versatile

simulation model, an inventory of the location and hour-by-hour emission rates of the varied sources of five pollutants was compiled, the major variabilities of the atmospheric dispersion processes over Connecticut were assessed. These products serve as the input variables to the simulation model. The source inventories show that, in 1967, man-made sources of air pollution in Connecticut will emit some 300,000 tons of oxides of sulfur, 129,000 tons of the oxides of nitrogen, 1,290,000 tons of carbon monoxide, 330,000 tons of hydrocarbons, and 63,900 tons of suspended particulates. Exemplary calculations of the expected air pollution levels in Connecticut under various meteorological conditions, as predicted by the simulation model, are presented. These examples show clearly the regional variability of air quality; they illustrate the power of the model to evaluate of complex planning and control problems inherent in effective air resource management. Connecticut will have the advantage of a system that can evaluate the air quality implications of control plans before they are implemented and also define, in unprecedented detail, the causes of present and future air pollution problems. (Author summary modified)

15158

Lahmann, Erdwin and Siegfried Haentzsch

AIR POLLUTION BY HYDROCARBONS. (Luftverunreinigung durch Kohlenwasserstoffe). Text in German. Staedtehygiene (Weissen/Hamburg), 20(10):243-246, 1969. 15 refs.

At the side of a busy road in Berlin, automatic air quality measurements (mainly of hydrocarbons) were taken for a total of six months between 1967 and 1968 using the Beckman hydrocarbon analyser 102 A. The air samples were taken at 75 cm above the pavement. The measurements were made mostly from 6 a.m. to 10 p.m. and a total of 3500 half-hourly values were obtained. It was found that 75% of the individual values belonged to the concentration range of 3 to 7 ppm hydrocarbons (methane equivalents) and 1.6% of the values exceeded 10 ppm. The arithmetic mean of all values was 5.09 ppm, the 50% value of the cumulative frequency was 4.5 ppm, the 95% value of the cumulative frequency was 8.4 ppm, and the 98% value of the cumulative frequency was 9.8 ppm. The three highest concentrations measured were 17.2, 15.9, and 15.1 ppm. The highest hydrocarbon concentrations were measured during traffic rush hours in the morning and afternoon. The measured concentrations are not considered to be dangerous. In 1959, the maximum allowable concentration for gasoline was set at 500 ppm. The maximum allowable atmospheric concentration is 20 ppm (long-term) and 60 ppm (short-term). A table of hydrocarbon concentrations found in several American cities between 1962 and 1966 is included.

15249

Pailer, M., H. Degutter, H. Hausenn, and J. A. Schmiding

BENZO(A)PYRENE CONTENT OF DUST SAMPLES FROM THE METROPOLITAN AREA OF VIENNA. (Benzo(a)pyrenegehalt von Staubproben aus dem Wiener Stadtgebiet). Text in German. Oesterr. Chemiker-Zeit., 67(6):222-5, July 1966. 15 refs.

To determine the benzo(a)pyrene content of 31 random dust samples collected on glass fiber filters in Vienna, the filters were extracted with benzene, the benzo(a)pyrene was separated with thin-layer chromatography, and the concentration was determined by spectrophotometry. The samples were obtained from January 1965 to October 1965. In warm weather, concentrations between 10 and 70 micrograms/1000 cu m were measured. In winter months, the concentrations were much higher (123 to 165 micrograms/1000 cu m). Concentration measurements outside the city in the summer yielded values between 0.5 and 0.8 micrograms/1000 cu m. No relationship could be found between the dust concentration and the benzo(a)pyrene concentration. Comparison of the results with those of other cities shows good agreement. Inhaling 20 cu m of city air (100 micrograms benzo(a)pyrene/1000 cu m daily is shown to be equivalent to inhaling smoke from 50 to 60 cigarettes (0.01 micrograms benzo(a)pyrene).

15287

Sur Ruehlen, Thorkil

MEASUREMENTS OF STYRENE EMISSIONS AND IMMISSIONS WITH THE AID OF GAS CHROMATOGRAPHY. (Messungen von Styrol-Emissionen und -Immissionen mit Hilfe der Gaschromatographie). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, vol. 16(4)-41, Feb. 1968. 15 refs.

Air samples for determining the concentration of styrene fumes in the vicinity of a processing plant for polyester resin were obtained with a gas collecting tube. A membrane pump was used to draw in 30 l air within a period of 5 minutes. In the gas chromatographic analysis of the samples; helium (99.99%) was used as a carrier gas and the operating temperature was 150 C. Calibration was performed according to the method described by J. May. At the outlet of the vapors, 340 ppm were measured; at a distance of 1 m, 130 ppm; at a distance of 10 m, 8 to 9 ppm; and at a distance of about 25 m, about 1 ppm. The odor threshold for styrene was found to be 1 ppm.

15575

Lehmann, E. and J. Westphal

RELATIONSHIP BETWEEN MOTOR TRAFFIC DENSITY AND AIR POLLUTION IN A METROPOLITAN STREET. (Beziehungen zwischen Kraftverkehrsdichte und Luftverunreinigungen in einer Grossstadtstrasse). Text in German. Strassenbau (Duesseldorf-Oberkassel), no. 6: 4p., 1968. 8 refs.

In the years 1966 and 1967, extensive air quality measurements were made on a busy street in Berlin. The relationships between the traffic density and the carbon monoxide, hydrocarbons and lead concentrations in the air above the street were determined. The CO was continuously measured with an infrared analyzer over a period of 12 months. The air samples were taken 75 cm above the pavement. Half-hourly averages were obtained from the continuously recorded CO concentrations. The hydrocarbon (CH) concentration was continuously measured with a flame

ionisation detector. The lead content was determined intermittently at a height of 1 m. Analysis of the precipitated dust for leadwas performed by the dithizon method. Simultaneously with the lead concentration measurements, traffic counts were conducted between 6 a.m. and 8 p.m. The correlation coefficients were determined for the relationship between traffic density and the CO, CH and lead concentrations. These were 0.90, 0.85, and 0.78, respectively. A correlation between the CO, CH, and lead content of the air and the traffic density was found when long-term averages were used for the comparison. Comparison of the measured results of just one day showed no correlation. The meteorological influence was stronger in this case than that of the traffic density. Concentrations of the various exhaust components were generally interdependent. In this way, measurement of just one substance is sufficient to obtain general information on air composition.

19600

Braja, N., G. Trespen and G. C. Vasini.

FIRST INVESTIGATIONS ON THE POLLUTION OF THE AIR OF TURIN BY POLYCYCLIC AROMATIC HYDROCARBONS. (Prime ricerche sull'inquinamento da idrocarburi policiclici aromatici nell'atmosfera urbana di Torino). Text in Italian. L'Igiene Moderna, 52(1-2):27-45, Sept. 1959. 9 refs.

Polycyclic aromatic hydrocarbons (PAH), among the substances most frequently accused of cancerogenic powers, are the products of incomplete combustion. Due to the high boiling point of PAH (above 150 C), they easily condense into soot particles and are conveyed in this form, leading to a certain correlation with the dust content of the atmosphere. Results of PAH determinations were evaluated by gas chromatography, recently shown as superior to technical chromatography or spectrophotometry. Two types of sampling were used: protracted sampling when the air had a high dust content; and instantaneous sampling, at times of low dust content. Dust samples were collected every 15 days during the winter and spring, and once a month during the summer. A total of 110 samples were collected from 15 collecting points strategically located throughout the city. About 0.2 grams of dust from a sample was preserved in a plastic food bag in darkness, then placed in the flask, previously treated with acetone, of a Soxhlet apparatus, and extracted with 200 ml of cyclohexane for 16 hours. The cyclohexane was vacuum-evaporated at 35-40 C; the residue was dissolved in 10 ml cyclohexane and divided into two equal samples, one of which was added 0.1 ml of a standard solution of fluoranthene, chrysene, and benzopyrene. These were treated according to the technique of Hoffman and Wynder. A residue of 0.1 ml nitromethane solution was obtained, 1 microliter of which was used for gas chromatography with the Perkin-Elmer model 801, using nitrogen as the transport gas. The present article is limited to an evaluation of the first 55 tests made. The following PAH were identified: anthracene, fluorene, chrysene, 1,2-benzanthracene, and 3,4-benzopyrene. An unknown group of peaks also appeared on the chromatogram which has been noted with chromatograms of auto exhaust gases, suggesting a possible relationship.

15610

Odaira, Toshio

AIR POLLUTION FROM MOTOR VEHICLE GASES IN TOKYO AND OSAKA. (Dai toshi ni okeru jidosha haiki gas ni yoru taiki osen no jittai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(5):337-351, 1969. 17 refs.

Various pollutant concentrations were determined near highways and surrounding areas in Tokyo and Osaka. A large amount of carbon monoxide was found near the highways, and gradually decreased in the surrounding areas. The difference in the height of the pollutant between the highway and surrounding areas could not be measured to 100 m if the wind was slow and natural convections occurred. The carbon monoxide concentration was found to be related to traffic density. The four pollutant patterns differed from each other in the dust content, sulfur dioxide and nitrogen dioxide content, carbon monoxide and nitric oxide content, and ozone content. The average CO was 3 to 6 ppm/yr; however, 40 to 50 ppm/hr was not rare. In the middle of the city, over 10 ppm/hr was measured 2% of the time. In the districts that were 100 to 200 yards from the highway, the monthly average was 5 to 6 ppm, but 30 to 50 ppm/hr sometimes occurred. In winter, this became serious. Nitric oxide concentrations were 0.05 to 0.25 ppm along the highway; NO2 was estimated to be less than 0.05 ppm. For the surrounding districts, NO was 0.05 to 0.15 ppm in winter and 0.01 to 0.05 ppm in summer. Hydrocarbons averaged 7 ppmC/m along the highway. Carbon monoxide, NO, and the hydrocarbon concentration curve changed during the day. Oxidants averaged 0.02 to 0.06 ppm/m and sometimes 0.15 to 0.25 ppm/hr. These measurements reveal that photochemical smog is important in Tokyo. Lead was 1 to 9 mg/cu m along the highway and 0.7 to 5 mg/cu m in the surrounding districts.

16266

Hudson, Gerald

AIR QUALITY SURVEY, EL PASO METROPOLITAN AREA. Texas State Dept. of Health, Austin, Div. of Occupational Health and Radiation Control, PHS Grants 598-4701-01 and 598-4707-00, 160p., 1969. 12 refs.

An air sampling program was conducted from Oct. 17, 1968 to Nov. 17, 1968 to determine ambient air quality for the El Paso Metropolitan Area. The concentration and location of air pollutants present in the lower atmosphere were determined. The pollutants monitored were particulate matter, sulfur dioxide, hydrogen sulfide, carbon monoxide, total hydrocarbons, aldehydes, nitrogen dioxide, and ozone. Twenty five fixed sampling sites were chosen in representative locations throughout the area. There were numerous occurrences during the survey of periods of atmospheric stagnation which caused a buildup of pollutants. The period for the survey was deliberately chosen to coincide with the period of the year having the greatest frequency of atmospheric stagnation. A desire to obtain measurements of maximum air pollutant concentrations was a major factor in making this choice. Concentrations of suspended particulates were greater than the ambient air standard of 200 micrograms/cu m 28% of the time.

The sulfur dioxide ambient air standard was 0.2 ppm for 24 hr and 0.5 ppm for any 30 min period. Sulfur dioxide readings monitored during the survey were less than or equal to 0.15 ppm 97% of the time. Concentrations were greater than 1.0 ppm for 10-minute averages on two occasions. Concentrations of greater than 0.5 ppm for one hour were found less than 0.2% of the time. Carbon monoxide values ranged from 0 to 18 ppm, depending on traffic volume. The ambient air standard was not met. Standards for total hydrocarbons were not met either, but hourly averages ranged from 0-10 ppm. It was concluded that the El Paso area has an air pollution problem and the major pollutants are particulate matter, sulfur dioxide, carbon monoxide, and total hydrocarbons. Promotion of air pollution control and control methods were recommended, as well as legislation restricting emissions. Tables are given for industrial and metropolitan emission inventories, soiling index, steel plate corrosion, and particle size distributions. Climatology, topography, and meteorological parameters are discussed.

16136

Schaad, R. and A. Gilgen

BENZO(3-4)PYRENE IN THE DUST SEDIMENT OF ZURICH, BADEN AND KLOTENER RIED. (3,4-Benzpyren in Staubsediment von Zuerich, Baden, und Klotener Ried). Text in German. Z. Praeventivmed., 14(5):399-400, Sept.-Oct. 1969. 9 refs.

To determine the benzo(3-4)pyrene content of the dust and the amount of benzo(3-4)pyrene in the human environment dust was sampled with Bergerhoff units. The samplers were established at 15 stations in Zurich, at 5 in Baden, and at one in Kloten. Each station contained three units. The water insoluble fraction of the monthly dust sediment was separated; the benzo(3-4)pyrene was extracted with cyclohexan and analyzed with a spectrometer. The benzo(3-4)pyrene content of the dust in the city of Zurich was more than twice as high as the dust sedimented in rural areas. The concentration was much lower in Baden than in Zurich, but higher than in the rural area. The sedimented benzo(3-4)pyrene quantity in Zurich in summer was two and one half times larger than in the rural area; in winter, five times larger. It was twice as high in Baden than in the rural area. The benzo(3-4)pyrene source can be clearly traced to the motor vehicles in summer and to domestic heating in winter.

16880

Reinoffy, Sallvesster and Josnef Novik

SOME RESULTS OF THE INVESTIGATION OF AIR POLLUTION CAUSED BY ROAD TRAFFIC. (A koslekedes okozta legszennyezodes vizsgalatanak nehany eredmenyei). Text in Hungarian. Idojaras (Budapest), no. 6:327-331, 1967. 7 refs.

The dust producing effect of road traffic in Hungary was investigated. In addition the concentrations of carbon monoxide, 3,4-benzopyrene, and hydrocarbons were also measured near filling stations. In dry weather, an airborne dust content of 7.0-8.8 mg/cu m on macadamized roads and 3.5-5.2 mg/cu m on concrete roads was found. In rainy weather, the amount of dust was

reduced to 2.1-3.6 mg/cu m. On roads with a dust free covering, under average traffic conditions, the dust content was 15,000-20,000 particles/l of air. In urban regions, the average number of particles was 100,000/l of air. Thus, the dust pollution caused by road traffic was of the order of 1 mg/cu m of air. Vehicles followed by a plume of smoke were frequently seen. In the wake of a strongly smoking tractor, 1-1.5 million particles/l were found. In the busiest parts of Budapest, the average concentration of CO amounted to 20 mg/cu m. The concentration of carbon dioxide ranged from 0.01-5.00% of the total value, with an average of 2% of the volume. The tar content of the street dust, collected at busy points, was 3%, and the content of 3,4-benzopyrene equalled 9 micrograms per 1 gram of dust. (Author abstract modified)

K. LEGAL AND ADMINISTRATIVE

00152

AUTOMOTIVE AIR POLLUTION IV. (A REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (2nd Session.) (Document No. 101.) July 28, 1966. 15 pp.

Emission standards in accordance with section 202 of the amended Clean Air Act have been established to limit the crankcase emissions and the exhaust hydrocarbons and carbon monoxide emissions of all passenger cars and light commercial vehicles with engines larger than 50 cubic inches total displacement, effective with the 1968 models. Procedures are in the final stage of development to enable manufacturers who so request to make application for certification that their vehicles or engines do conform with the Federal regulations as provided for in section 206 of the Clean Air Act. A Federal motor vehicle compliance laboratory is being established in metropolitan Detroit for confirmation and surveillance testing and to provide assistance and guidance to the vehicle manufacturers. Emission tests of 1966-model cars equipped with California-type exhaust emission controls are being conducted to determine the effectiveness of the systems, and, to some extent, their maintenance history is being reviewed. It is anticipated that when the 1967 models are introduced in California the program will be expanded to include a number of these cars as well. Extensive reports of industry progress in dealing with the automotive air pollution problem are appearing in technical presentations before the Society of Automotive Engineers; 10 such presentations were made in January 1966, and 7 more are scheduled for June 1966. The Public Health Service is placing increased emphasis upon studies which will lead to improved test procedures and which will form the basis for possible revisions in emission standards for future application. (Author)##

00169

A. J. Benline

1965 ANNUAL REPORT - DEPARTMENT OF AIR POLLUTION CONTROL - CITY OF NEW YORK. Dept. of Air Pollution Control News 8, (5) Apr. 1966. 40 pp.

City of New York, Department of Air Pollution Control, Annual Report for 1965, describes New York City air pollution progress as it relates to administration and personnel; engineering; public opinion; types of pollution; means and methods to curtail air pollution.##

00206

CONTROL OF AIR POLLUTION ORIGINATING FROM FEDERAL INSTALLATIONS AND STANDARDS OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE

IMPLEMENTING THE OBJECTIVES PRESCRIBED BY THE ORDER. EXECUTIVE ORDER 11282. Dept. of Health, Education, and Welfare, Washington, D.C. May 26, 1966. 6 pp.

The article specifies the overall policy, procedures for new federal facilities and buildings, and objectives for federal facilities and buildings insofar as air pollution control is concerned. In addition, standards to be used in this new order are delineated by Secretary Gardner. The categories to which the article alludes are: combustion of fuels, stacks, storage and handling of fuels and ash, and disposal of trash. In each instance are specified limits and means to measure the amount of pollutant covered by the above categories.##

00336

G. Gosline and R. Smith

A RAPID SURVEY TECHNIQUE FOR ESTIMATING COMMUNITY AIR POLLUTION EMISSIONS. Public Health Service, Cincinnati, Ohio, Division of Air Pollution, Oct. 1966. 23 pp. (Presented at the 59th Annual Meeting of the Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-71.)

A technique has been developed for surveying pollutant emissions within a community or metropolitan area in 3 to 6 man-weeks. The methods for conducting such a survey are described in this paper. An important feature of this technique is the concept of reporting zones. The quantities of pollutants released can be assessed not only for the total community but also for different subdivisions of the area. The results are emission maps of a community depicting emission of pollutants in quantities per unit area. Seasonal variations in pollutant concentrations are considered, and emission rates of pollutants can be calculated for specified times of the year. The four major source categories considered are combustion of fuels in stationary and in mobile sources, combustion of refuse material, and industrial process losses. Each category is considered in detail relative to sources of information, seasonal variation in emissions, methods for estimating pollutant emissions by areas, and use of emission factors. Results obtained by application of this technique in two metropolitan areas are summarized. (Author)##

00350

CONTROL OF AIR POLLUTION FROM MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES - PROPOSED RULES. Federal Register 30, (252) 15192-9, Dec. 31, 1965.

The standards adopted by the regulations represent the application of current technology to the control of emissions from new motor vehicles and new motor vehicle engines which in the judgment of the Secretary cause or contribute to, or are likely to cause or contribute to air pollution which endangers the health or welfare of any persons. Taking into consideration the technological feasibility and economic costs of meeting these standards, and the lead-time necessary

under current manufacturing processes to conform to these requirements, the regulations will become effective on republication and will be applicable to new motor vehicles and new motor vehicle engines beginning with the 1968 model year. These regulations are subject to revision and additional standards may be prescribed applicable to subsequent model years as may be necessary to prevent or control emissions which in the judgment of the Secretary cause or contribute to, or are likely to cause or contribute to, air pollution which endangers the health or welfare of any persons. (Author)##

00159

McKee, J. E.

AIR POLLUTION CONTROL - ECONOMIC IMPACT OF GROWING PROBLEM. Trusts and Estates. Feb. 1964. 5 pp.

Author discusses the general parameters of air pollution and how it has changed over the years. Categories treated are: Magnitude of the Air Pollution Problem; Establishment of Local Agencies; Standards and Criteria; Motor Vehicle Control; Power Plants; Federal Government's Role in Pollution; and the General Extent and Nature of the Air Pollution Problem.##

01609

U.S. Veneris

THE INTERSTATE AIR POLLUTION STUDY: ST. LOUIS - EAST ST. LOUIS METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Presented at Missouri Public Health Association Convention, Kansas City, May 11, 1965.) 1965. 22 pp.

The Interstate Air Pollution Study of the St. Louis - East St. Louis metropolitan area is described. The study was in keeping with the air resource management concept. Dustfall, suspended particulates, soiling index, sulfur dioxide, oxidants, odors, carbon monoxide, hydrocarbons, nitrogen oxide, nitrogen dioxide, sulfur dioxide, ozone, and visibility were measured. The effects indicated by steel corrosion, nylon and cotton deterioration, asthma, opinion surveys, and complaints were examined. An emission inventory, meteorology, fluorescent tracer diffusion, diffusion models, economic losses, legal aspects, and public relations were studied during the study.##

02055

E. P. Grant and W. E. Hanson.

CALIFORNIA'S PROGRAM FOR MOTOR VEHICLE EMISSION CONTROL. Proc. (Part 2) Intern. Clean Air Cong., London, 1966. (Paper VI/19). pp. 210-2.

The paper gives a general account of the extent of air pollution in the state of California and the measures taken to

far to control it. It proceeds to deal in greater detail with the investigations undertaken by the motor industry, especially by the Motor Vehicle Pollution Control Board and the various devices that have proved to be effective in keeping the objectionable emissions under control. (Author abstract)##

02176

AIR RESOURCE MANAGEMENT PROGRAM SOUTHWESTERN OHIO-NORTHERN KENTUCKY. Preprint. Published as report: Air Resource Management Program for Southwestern Ohio-Northern Kentucky, Mar. 1967. 51 pp. SWO - NK (Southwestern Ohio - Northern Kentucky) Air Pollution Survey, Cincinnati, Ohio, SWO - NK Technical Committee, 1966.

The primary purpose of this report is to assist the citizens and governments of southwestern Ohio and northet Kentucky in understanding the nature of their air pollution problem and in developing a course of action - an air resource management program - to assure desirable air quality both now and in the future. This report is the culmination of over a year of study and effort under the title, Southwestern Ohio - Northern Kentucky (SWO-NK) Air Pollution Survey. The survey, established by formal agreement on March 31, 1965, brought together governmental officials, interested citizens, and industrial leaders from both sides of the Ohio River to consider a problem common to them all and to propose a solution, of necessity, common to them all. This report also presents a general discussion of the air pollution problem and applies to it the ideal methodology for solving the problem, the air resource management concept. Various aspects of the air pollution problem in the project area are summarized from Technical Committee reports to provide background for the program proposal. The current status of control is also covered.#

03153

DIGEST OF MUNICIPAL AIR POLLUTION ORDINANCES. Pittsburgh Univ., Pa., Law Center. (PHS Publication No. 982.) 1962. 520 pp.

Regulations, ordinances and their administration regarding allowable concentration for air pollutants are presented. Enforcement procedures, inspection procedures, and penalties for violation of specific regulations are presented for urban areas. Air pollution control starts with the premise that no one has the right to use the atmosphere as a receptor of wastes in a manner which will adversely affect the health, comfort or property of others.##

03554

REGULATION 3. Bay Area Air Pollution Control District, San Francisco, Calif. Jan. 4, 1967. 44 pp.

This Regulation applies to emission of reactive organic gases from source operations defined and to the registration of each person responsible for organic gas emissions, for which limits are established by this Regulation. Analytical procedures prescribed are intended to facilitate the determination of

concentrations or quantities of the various kinds of air contaminants defined in this Regulation. Any procedure which provides for such determination with accuracy equal to or greater than the prescribed procedure shall be acceptable, provided that the burden of demonstrating such accuracy shall rest upon the person proposing the procedure.##

036141

J. T. Middleton D. Clarkson

MOTOR VEHICLE POLLUTION CONTROL. Traffic Quart. 19(2):306-317, April 1965.

This paper reviews briefly the work of control agencies in California, the legislation of the state's motor vehicle pollution control program of 1960, and its impact on the evolution of control programs in other states, the automobile industry and the motoring public.##

03948

MOTOR VEHICLE POLLUTION IN CALIFORNIA (A STATUS REPORT). California State Dept. of Public Health, Berkeley, Bureau of A r Sanitation. Jan. 1967. 11 pp.

A review of all the factors involved indicates that there is no simple and inexpensive solution to the complex problem of motor vehicle created air pollution. The problem has many aspects. It is legal, political, social, economical and technological. The final solution must incorporate considerations for all these aspects. The motor vehicle control program in California has reduced emissions of hydrocarbons and carbon monoxide into the atmosphere. In spite of the increasing number of vehicles, there has been a reversal in emission trends for the first time. If the goal of proper air quality is to be achieved, there must be a high degree of emission control. Consequently, the program requires that effective systems be available, and that virtually no cars be exempt. Lack of efficient control of some emissions, large numbers of cars uncontrolled, and deterioration in efficiency of control system will lead to air quality poorer than that desired. Under the present program, which is oriented towards the installation of control systems on new cars, the reduction of contaminants emanating from motor vehicles will be gradual. In order to accomplish a rapid improvement, within a few years, exhaust emissions from all cars (new and used) must be controlled. Even if events follow the predictions growth of motor vehicle usage beyond 1980 leads again to a rising trend. Curtailment time. Motor vehicle registration is increasing at a rapid pace; control programs are usually less effective than planned; there is a long time delay between the establishment of standards and the development of exhaust and evaporative control devices. For these reasons, and because of the poor prospect of exhaust control for used cars, it is important to consider far more stringent motor vehicle emission standards than those already adopted. (Author conclusions)##

05571

F. N. Frenkiel

AIR POLLUTION IN THE GROWING COMMUNITY. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa. pp. 1-15 (1956).

Like any living being, a living community breathes. Its automobiles, railroads, home heaters, rubbish disposals, industry, power plants....all inhale air and exhale polluted air into the atmosphere. Here, Dr. Frenkiel discusses methods for studying the relative contributions of various pollution sources to a community's pollution problem, the increase of pollution in a growing community, and the effectiveness of certain methods for reducing pollution. He explains how a mathematical treatment can clarify the interplay among the many features of a community that contribute to its general air pollution problem - the location and density of pollution sources, meteorological conditions, community geography, and control measures. The main object of these mathematical studies, he points out, is to determine the probable patterns that pollution will take, and the contribution of each source to the pollutant concentration at any given location. He cites a study of this sort made using as an example of Los Angeles County. This mathematical treatment, or "model", then helps determine what measures must be taken when atmospheric pollution threatens to reach emergency levels, how effective various pollution control plans might be, what effect a new source might have on the pattern of concentration, forecasts of patterns that would result from contemplated urban expansion, and the effect of urban planning on predicated pollution levels.##

05598

AIR AND WATER POLLUTION. Ohio Legislative Service Commission, Columbus, Ohio. (Staff Research Dept. 84.) (Feb. 1967). 87 pp.

This study deals separately with air and water pollution problems. Chapters five, six, seven, and eight are concerned with air pollution. They consider the nature and effects of air pollution, the extent to which it is a problem in Ohio, the programs and efforts being made to reduce the problem in Ohio, some problems in existing programs, and finally some suggested approaches for improving control of Ohio air pollution. The chapters dealing with water pollution are treated in essentially the same way. The sources of air pollution are pointed out as motor vehicle exhausts, industrial emissions, and power generation as major sources and refuse disposal and space heating as minor sources. The effects that are caused by pollutants are varied but generally they affect human health, comfort, and welfare. In Ohio, a highly industrialized and urbanized state, the potential for serious air pollution problems is great, but an absence of uniform and complete data on all known air pollutants in the state precludes an accurate state-wide assessment. It, of course, reflects the national trend in terms of pollutants. However, air pollutions in a particular area has not yet been evaluated. It is known that the levels of some pollutants are declining, but data on some major gases are not available. Ohio is currently using five basic functions in their air pollution control program: abatement,

prevention, monitoring, research and planning. Federal, state, local and intergovernmental levels are all being used to attack the problem. The Report of the Committee to Study Air and Water Pollution is included, and it stresses the need for more stringent regulations to enforce present and future statutes, especially at the local level.##

06188

Larsen, Ralph I.

DETERMINING REDUCED-EMISSION GOALS NEEDED TO ACHIEVE AIR QUALITY GOALS--A HYPOTHETICAL CASE. J. Air Pollution Control Assoc., 17(12):831-839, Dec. 1967. 37 refs. Presented at the Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

Air management steps involved in determining reduced-emission goals include determining the effects of various pollutant concentrations on man, animals, plants, and property; deciding which effects to prevent; selecting ambient air quality goals that will prevent these effects; measuring and evaluating pollutant concentrations from sources and in the ambient atmosphere; calculating overall source reductions needed to achieve selected ambient air quality goals; and finally, determining reduced-emission goals for the various source types. Examples are cited of the various decisions and actions involved in determining a set of reduced-emission goals for stationary and mobile combustion sources.

01545

H. Langmann

CLEAN AIR MAINTENANCE--A TASK FOR THE OFFICE OF PUBLIC HEALTH. Die Reinhaltung der Luft als Aufgabe des Gesundheitsamtes. Oeffentl. Gesundheitswesen (Stuttgart) 29 (3), 126-34 (Mar. 1967). Ger.

Government regulations request that the office of public health pays attention to the maintenance of clean air. Note specifically, it must screen projected industrial enterprises as to the degree of their expected air polluting emissions and the eventual impact on the health of the employees and the neighboring inhabitants. In cases where the office of public health through its investigations finds evidence of health hazards, it must recommend various ways of avoiding or eliminating the pollution of air. A large number of pollutants are discussed, such as dust, toxic gases, and obnoxious vapors and odors. Their sources and methods for their elimination are discussed in detail and represented by examples. Particular emphasis is placed on proper city planning, zoning, and a more stringent application of regulations concerning the construction of new plants, especially their chimneys. Further investigations into possibilities of remote heating and of substituting gas and electricity for coal are recommended. Finally, the importance of educating the public on the consequences of air pollution is stressed.##

07683

Maher, G. H.

AIR POLLUTION REGULATION OF SUBVEHICULAR, ORGANIC-SOLVENT EMISSIONS BY LOS ANGELES RULE 66. J. Air. Oil Chemists Soc. 44(8):502A, Aug. 1967. (Presented at the AOCS Short Course, East Lansing, Mich., Aug. 29-Sept. 1, 1966.)

In an effort to control sources emitting organic solvents into the atmosphere, the Air Pollution Control District of Los Angeles County, Calif., successfully secured passage of Rule 66 into law. Rule 66 specifically relates to the control of organic solvent emissions from stationary sources. The major contributor to the 550-ton daily emission of organic solvents was industrial, commercial, and residential painting. Organic solvent-containing products are to be controlled as follows. 1. A maximum of 5% by volume of olefinic or cycloolefinic organic solvents may be present. 2. A maximum of 8% by volume of aromatic organic solvents having eight or more carbon atoms may be used. 3. Ketone organic solvents having a branched chain structure, such as methyl iso-butyl ketone, are limited to a maximum of 20% by volume. 4. A maximum of 20% by volume of toluene may be used. 5. Ethylbenzene, an aromatic organic solvent with eight carbon atoms, was given a special status and allowed a maximum of 20% by volume. 6. Trichloroethylene is restricted to a maximum of 20% by volume.##

07550

Philadelphia Dept. of Public Health, Pa.

AIR POLLUTION FROM FUEL COMBUSTION PROCESSES IN PHILADELPHIA. Preprint, 8p., Sept. 1966.

The combustion of fuels is the greatest single source of air pollutant emissions within a metropolitan area. As much as 80% of the total weight of pollutants discharged to the atmosphere result from the burning of fuels for electrical power generation, for industrial and commercial heat and power, for domestic heating, and for vehicular power. The purpose of this report is to summarize the present status of the problem in Philadelphia and to recommend necessary regulations and other action required to deal with the problem.##

07605

AUTOMOTIVE AIR POLLUTION - SIXTH REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE CONGRESS OF THE UNITED STATES IN COMPLIANCE WITH PUBLIC LAW 87-206 AS AMENDED BY PUBLIC LAW 89-272. Dept. of Health, Education, and Welfare, Washington, D. C., Document No. 47, 19p., June 1967. (90th Congress, 1st Session, Senate.)
GPO: 83-697-0

Satisfactory progress is being made in the testing and certification of 1968 model vehicles or engines to determine conformance with the federal regulations as provided for in section

206 of the Clean Air Act. With few exceptions, virtually all major manufacturers, known to import or sell cars in the United States, are working diligently to fulfill requirements to limit crankcase emissions and exhaust hydrocarbon and carbon monoxide emission. This certification program is being conducted at the Motor Vehicle Compliance Laboratory of the National Center for Air Pollution Control. A proposed standard for fuel evaporative emissions from motor vehicles was issued by the Secretary of Health, Education, and Welfare on February 9, 1967. Modification of this proposed standard is currently underway based on the comments received. Several state and regional air pollution control agencies have established crankcase and exhaust emission standards in recent months which are either consistent with Federal standards or involve nonfederally regulated pollutants. Both industry and government have markedly increased study and evaluative activities toward development of pollution-free vehicles. The future trend of air pollution levels associated with gasoline-powered vehicles, which incorporate emission controls currently envisioned practicable, has done much to stimulate these development efforts. Progress toward pollution-free cars should not wait for and depend upon the development of the ideal lowest-cost emission controlled gasoline-powered system. (Author's summary)

08808

Eaton, F. J.

NATURAL GAS AND CLEAN AIR. Smokeless Air, 37(193):233-241, 1967. 9 refs.

The present position and possible future development of natural gas is based on the effect which this new indigenous smokeless and sulphur-free fuel can have on clean air in Great Britain. The finding of North Sea gas in sufficient quantities has led the Gas Council to base its future development on a change over from town to natural gas. The liquid natural gas imported primarily to enrich the gas made by some of the newer processes is not being used to supply the first conversion areas. Since the passing of the Clean Air Act in 1956 there has been a significant change in the pattern of domestic fuel usage. Solid smokeless fuels have increased in types and in sales. Town gas has gained in popularity with the public, particularly for domestic space heating, both with room heaters and central heating. Further, it is being used much more widely in Smoke Control Areas. This has been attributed to public demand for a convenient fuel and higher standards of heating, as well as to the improved competitive price position.##

08854

Haen, Warren H.

RULE 66 - A PART OF TOTAL AIR POLLUTION CONTROL. S.A.E. (Soc. Automotive Engrs.), Preprint #790B7, 8p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

The part Rule 66 plays in total air pollution control in Los Angeles County is explained. Background material on the control of

visible emissions, sulfur, hydrocarbons, and motor vehicle emissions is presented. Finally, the background and acceptance of Rule 66 is described. (Authors' abstract)

08556

Lunche, Robert G.

COMPLYING WITH SOLVENT CONTROL LEGISLATION. S.A.E. (Soc. Automotive Engrs.), Preprint 670810, 3p., 1967. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

Compliance with Los Angeles County solvent control legislation be achieved by treatment of the organic emissions resulting from solvent usage, converting to less photochemically reactive solvents, or changing the process. An engineering permit system and an enforcement inspection program ensure that control equipment to treat the effluent is designed for the required efficiency and operated in compliance with the law. (Authors' abstract)

08561

Bean, Laurence H.

RISING UP ANTI-POLLUTION LEGISLATION. Chem. Eng., 74(15):191-196, July 17, 1967. 15 refs.

At instigation of Federal Government, states are working rapidly toward effective standards for regulating quality of water and air. Standards for water will depend primarily on authoritative technical opinion and will vary according to local conditions. Standards for air quality will come increasingly under direction of Federal Government and will tend to be more uniform from locality to locality. Air control, state laws and regulations, municipal laws and regulations and the pattern for the future are six pollution topics discussed. Other topics dealing with water pollution are discussed.##

08526

THE AMERICAN PAINT CONVENTION: AVR POLLUTION AND RULE 66 DISCUSSED. Paint, Oil Colour J. (London), 152(3605):908-912, Nov. 17, 1967. 35 refs.

The discussion of the panel on air pollution at the annual meeting of the Federation of Societies for Paint Technology is reported. The panel consisted of four speakers and a chairman, or moderator, drawn from various parts of industry, and including raw material and equipment manufacturers. The history of the recent legislative proceedings, a review of other local rules and by-laws, problems of reformation and elimination of air-polluting products were discussed by the panel. Rule 66, which was implemented on July 1, 1967, was the final result of prolonged work and followed the drafting of 65 intermediate regulations, some of which threatened the very existence of many industries in Los Angeles.

The complicated nature of Rule 68 was made apparent from the numerous printed commentaries in the form of questions and answers. Reverting to methods of control and disposal of excessive air pollution emission as discussed by the panel, three major sources of air-pollution in the manufacture of paint and ancillary products and their use were considered, namely: (1) Resin manufacture; (2) Paint application and drying; and (3) Paint baking. The panel did not concern itself with details of reformulation, otherwise than to indicate the basic problems facing formulations.##

00699

NEW PROCEDURE CHECKS VEHICLE EXHAUST EMISSIONS. #ENVIRON SCI. Technol.; 2(1):13-16, Jan. 1968.

The U.S. Department of Health awarded a two-year contract to Scott Research Laboratories to develop a rapid low-cost diagnostic test for exhaust emissions from automobiles. It was this project that led to a new test sequence and equipment that takes one minute to complete at a cost of 30 to 40 cents per test. The test procedure gives information on the composition of automobile exhaust emissions. These data, in turn, provide a basis for determining the proper maintenance program needed to reduce vehicle emissions. The test procedure takes only a minute for a complete analysis and gives data equivalent to those obtained from the lengthier (17 minutes) existing federal procedure that was used to set federal emission standards for 1968 automobiles. The Scott system employs a set of inertial rolls with a fixed load that serves as external loading to absorb the power output of the automobile. This fixed loading system is inexpensive and requires minimal skill to operate. Yet, data so obtained correlate well with those from the federal procedure.

00951

Copeland, John G.

AIR POLLUTION. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 9p., 1967. (Remarks made at a meeting of the Illinois Society of Professional Engineers, Edwardsville, Ill., Oct. 20, 1967.)

In a talk based on information from other U. S. Public Health Service publications, the air pollution problem is described as one of emissions, effects, regulation, and control touching the technical, social, political and economic aspects of our society. U. S. Public Health Service 1968 estimates of 142 million tons of pollutant emissions per annum are reported by type and source with predictions for rapid increases unless air pollution is controlled in the near future. Air quality criteria are stressed as necessary guidelines for control. Authority for control is described as lying with many jurisdictions with the trend being toward centralization to cover every locality within the United States. The federal role in air pollution is discussed. The need for the skill and knowledge of the professional engineer in the air pollution field is described as unlimited.##

09281

California Motor Vehicle Pollution Control Board, Los Angeles

SMOG: THE SILENT ENEMY. (FOURTH BIENNIAL REPORT FOR CALENDAR YEARS 1965-66.) 32p., Jan. 1967.

California has led the world in the fight for cleaner air. Nowhere are found such dynamic and aggressive programs, both on local and statewide levels. Nowhere are there more dedicated men and women engaged in the effort. Admittedly, the automobile is a major factor in befouling our atmosphere. The ultimate solution to the motor vehicle pollution problem may lie in a completely redesigned automobile engine or in a new motive power source. The Board has thoroughly examined these possibilities, such as the turbine and battery-powered car, and is encouraged for the future, perhaps a decade hence. But, until that time, the State must proceed with its present plans to reduce auto-created pollution with workable control systems or engine modifications. Through sustained, persistent efforts by a determined Administration, State Legislature, and Board, the automobile industry has acknowledge and complied with California's leadership. Today, emission control is a fundamental factor in automobile engineering. For the first time all the worlds engine designers are hard at work on the problem. Today, emission control is (built-in,) not (added on,) to every Detroit product. This represents a phenomenal advance in the space of six and a half years. It will continue to result in a better product for the California car purchaser. All new California automobiles now come equipped with both crankcase and exhaust emission control systems. The Highway Patrol is making random roadside checks to make sure that motorists are complying with the law, and the Department of Motor Vehicles has co-operated in carrying out the necessary registration procedures for controlled vehicles. Stricter emission standards must be applied in 1970. Oxides of nitrogen control systems will be incorporated into existing controls, if they are in harmony with hydrocarbon and carbon monoxide controls. Evaporative losses must also be reduced, with a consequent economic saving to the motorist. The Board is actively seeking and hopes to find a simple portable measurement device for all emissions. This would simplify annual emission inspection for all vehicles. There is no doubt that as time passes emission reduction systems will improve rapidly. The art and science of emission control are still in their infancy, but moving ahead.

09128

S. S. Griswold

SOLVENT CONTROL - A NATIONAL PROBLEM. Preprint, Society of Automotive Engineers, 15p., 1967. (Presented at the Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967. Paper 670806.)

Comments on Los Angeles' Rule 66 for the control of organic solvents with respect to the Federal government and to other parts of the country are presented. Compliance by the Department of Defense and Government Services Administration installations is emphasized.##

09170

Stockton, Edward L. and Winthrop C. Shook

AUTOMATIC AIR MONITORING AND TELEMETERING TO CENTRAL POINTS IN ALLEGHENY COUNTY. J. Air Pollution Control Assoc., 18(3):182-185, March 1968.

In 1968 an automatic monitoring system will supplement existing air sampling stations in Allegheny County (Pittsburgh). This system will measure pollutant levels and weather conditions at several remote sites. "On-site" recorders are equipped to telemeter the data in analog form to a central station. At the central station a multipoint recorder is supplied for each pollutant measured. This basic system, purchased for a modest initial investment, has complete capabilities for future expansion. An estimated fifteen sites will provide representative pollution data for Allegheny County. However, the basic system can be expanded to include industry installed monitoring stations--a possibility now being considered. Further expansion to a complete data management system including a computer based data logger to calculate emission inventory, peak averages, and other control data is also provided for. (Authors' Abstract Modified) 8f

10081

Flora, George W.

AIR POLLUTION AND PROTECTIVE COATINGS: HOUSTON, DALLAS, AND WASHINGTON. J. Paint Technol., 40(520):333-338, May 1968. 18 refs.

In general, man-made air pollutants are largely products of combustion, and solvents from protective coatings are not major air pollutants. Photochemical smog prevalent in Los Angeles results from inter-reaction between oxides of nitrogen, reactive hydrocarbons, an oxygen. Hydrocarbons vary greatly in their reactivity; hydrocarbon found in solvents are less reactive than auto exhaust. Data are provided on common air pollutants in Houston, Dallas, Ft. Worth, and Washington. Rule 66 and its definition of photochemically reactive solvents are examined with respect to the use of protective coatings in the San Francisco Bay Area. Where federal specifications apply, the Bay Area Air Pollution Control District has agreed to draw up a variance to January 30, 1969. So far, Rule 66-type regulations have not been adopted anywhere other than California. The New York, New Jersey and Pennsylvania regulations and proposed rules are discussed Industry must cooperate with local authorities to reduce general air pollution. The National Paint, Varnish and Lacquer Association smog chamber at Battelle Memorial Institute should provide data relative t the extent solvents add to photochemical smog.

10305

PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION. FIRST REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE UNITED STATES CONGRESS. PURSUANT TO PUBLIC LAW 90-148, THE AIR QUALITY ACT OF 1967. 2nd Session, 90th Congress, Senate Document No. 92, 89p., June 28, 1968. GPO

recent activities instituted under the Air Quality Act of 1967, which was signed into law in November 67 are described, and the air pollution problem as a whole is placed in historical perspective, summarizing the outstanding efforts being made to cope with it. Included are: (1) the programs and problems associated with control of automotive exhaust emissions and the research efforts related thereto; (2) the development of air quality criteria and recommended emission control requirements; (3) the status of enforcement actions taken pursuant to this Act; (4) the status of state ambient air standards setting, including such plans for implementation and enforcement as have been developed; (5) the extent of development and expansion of air pollution monitoring systems; (6) progress and problems related to development of new and improved control techniques; (7) the development of quantitative and qualitative instrumentation to monitor emissions and air quality; (8) standards set or under consideration pursuant to title II of this Act; (9) the status of state, interstate, and local pollution control programs established pursuant to and assisted by this Act; and (10) the status of the President's Air

10320

Jan Just, and Kazimiera Nowak

ATMOSPHERIC AIR POLLUTION IN POLAND. (Zanieczyszczenie powietrza atmosferycznego w Polsce.) Text in Polish. Gaz Woda Tech. Sanit. (Warsaw), 40(3):103-07, 1967. 10 refs.

Although some attempts at air pollution control date to 1933, the first directives against offending local industrial establishments were issued in 1950 and extended in 1960 to the entire country. Comprehensive air protection legislation was initiated in Poland by Resolution 91 of the Council of Ministers of March 7, 1961. The Ministry of Health and Public Welfare has prepared a projected legislation introducing air pollution controls and establishing permissible pollutant concentrations. This proposal is now being considered by the Juridical Committee of the Council of Ministers. There are 16 institutions engaged in air pollution research and a network of stations is gathering data (mostly on dust fall, SO2, and suspended particulates) but only from the more industrialized parts of the country. The actual gravity of the situation is illustrated by the fact that six million of Poland's population live in a high-pollution zone. Most affected is Katowice province, with the capital Katowice recording a dust fall of 640.4 t/sq km/yr, about 0.3 mg/cu m fumes, 0.007-1.25 mg/cu m SO2, and 73 g/1000 cu m benzopyrene. Details of these pollutants far exceed the permissible limits. Opole province is also in the high-pollution zone as well as the cities of Krakow (100-600 t/sq km dust fall and 0.008-0.43 mg/cu m SO2), Lodz (565.3 t/sq km dust fall with significant CO2 and H2S level), and Warsaw (dust fall in 1963 was 315 t/sq km, compared to 359 t/sq km 30 years earlier). The improvement in Warsaw is ascribed to the replacement of household coal by electric power and gas, to modernized and centralized heating, and to post-war reconstruction of the city with a major emphasis on green zones.##

10551

Huenigen, E.

PRESENT STATUS OF EXHAUST GAS CONTROL IN THE GDR (EAST GERMANY). (Bisherige Ergebnisse der Abgasbekaempfung in der DDR.) Text in German. Freiberger Forschungsh. A: 387:17-30, 1966.

The research council on the control of internal combustion engine exhaust gases of the German Democratic Republic (GDR) set as its goals in 1964: a) the improvement of the quality of diesel motor exhausts; b) reduction of the hazards from exhausts of two-phase gasoline motors; c) development of suitable analytical methods, measurement installations and testing programs; d) an extensive detoxification of exhaust gases from the diesel motors of specialty vehicles. In the furtherance of these aims, a thorough state-of-the-art study of diesel smoke density measurement was carried out, including actual testing of over a dozen different types of instruments. The results of these tests and studies are described and illustrated. Difficulties in the determination of CO, CO2, nitrogen oxides, hydrocarbon residues, and benzopyrene, are discussed. An investigation of the influence of a French after-burner device on CO emission and smoke density showed unsatisfactory abatement results. The use in East Germany of "liquid gas" as an automotive fuel yielding low CO and hydrocarbon exhausts is mentioned.##

13166

Japan. Prime Minister's Office.

1969 WHITE PAPER ABOUT PUBLIC NUISANCES. (Kogai hakusho). Text in Japanese. (Prepared in collaboration with 11 ministries and agencies, Government of Japan, for submission to the Japanese Diet). Tokyo, Printing Bureau of the Ministry of Finance, 1969, 218p.

This report summarizes the status, monitoring techniques, and management, including laws, of air and water pollution, noise and vibration, and soil erosion in Japan in April 1969. Particulate air pollutants in Japan are of four types: falling dust, which contains large particles and includes soot from burning coal or muddy dust; sulfur oxides, which are becoming increasingly important because of the increasing use of petroleum in recent years; floating dust, which has very small particles and includes mainly molecules of metallic compounds from burning materials and carbohydrates; and engine exhaust gas containing CO, NOx, hydrocarbons, and aldehydes. The amount of falling and/or floating dust has been gradually decreasing with the decreasing use of coal, especially in large industrial cities. At the same time, sulfur oxides, especially SO2, have been gradually increasing and have the highest concentration (more than 1.5 mg SO2/100 sq cm/day) in Kawasaki, Yokohama, Nagoya, Tokyo, Osaka, Kurashiki, and Yokkaichi. Among the harmful effects of polluted air on the human body, the ill effects on the respiratory tract (especially on the lungs) are most important. Chronic bronchitis, bronchial asthma, pulmonary emphysema, pulmonary fibrosis, pulmonary cancer, and oat pulmonale are the main lung diseases induced by polluted air.

3, 4-benzopyrene, which is a component of automobile exhaust gas, has experimentally proved to be carcinogenic. In May 1962, the Los Angeles Pollution Control District was established to control the ambient air system, and three large city groups (Tokyo-Yokohama, Osaka-Kobe, and Kitakyushu) were designated as air-polluted areas. Several cities, including Yokkaichi, were subsequently designated. This law was improved in May 1968, especially from the viewpoint of prevention. A law which sets limits for automobile exhaust-gas emissions has also been in force since September 1968. Air pollution is continuous in Japan at more than 170 points. In recent years, several techniques of preventing air pollution have been developed with varying success: use of activated carbon or activated manganese dioxide to reduce SO2 concentrations; quantitative and qualitative measurement of air pollution severity using a simulation model of a polluted area; modification of internal-combustion engines; and development of electric automobile engines.

L. STANDARDS AND CRITERIA

00157

Nagy, John A. and John E. Kinsman

MOTOR VEHICLE EMISSION STANDARDS - PRESENT AND FUTURE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 297-306. 10 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

In California, the State Dept. of Public Health has established motor vehicle emission standards for exhaust hydrocarbons, carbon monoxide and smoke; for fuel tank and carburetor evaporative losses; and for crankcase hydrocarbon emissions. The data on which the standards are based and the need for improved measurement procedures are discussed. At this time, exhaust emission standards for oxides of nitrogen and for odor are being considered as additional standards. Future standards may rate hydrocarbon emissions according to their smog potential. Another possible change that is discussed is to specify the quantity rather than the concentration of pollutants that may be emitted from the exhaust of motor vehicles.##

00411

H. Hora

(THE PROBLEM OF HYGIENICALLY PERMISSIBLE LIMITING CONCENTRATIONS OF AIR POLLUTION.) Zur Frage der Hygienisch zulassigen Grenzkonzentrationen Fur Luftverunreinigungen. Angew. Meteorol. (Berlin) 5 (Special Issue) :39-43, 1965. Text in Ger.

The problem of determining permissible limits of air pollution is discussed. After listing four categories of pollution ranging from decreased visibility and injury to sight and smell to acute illness and possibly death, the author states that pollution should be kept below the limits of the first category. He distinguished between limits permissible in a factory area and in a residential area, the first being higher. Permissible limits for 40 chemicals established in 1963 for single occurrences and average 24 hour concentrations for East Germany are tabulated.##

01955

J. E. Goldsmith

SOME IMPLICATIONS OF AMBIENT AIR QUALITY STANDARDS. Arch. Environ. Health 9, 151-67, Feb. 1965. (Based in part on a

paper presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 13, 1961.)

Author discusses the parameters of the air quality standards in California, starting with the efforts in 1959 and updating the progress to 1962. Allowable concentrations of pollutants are given; a general discussion of health based on air quality studies is given and, the general policy of California air quality standards is reviewed.##

03500

MAXIMUM PERMISSIBLE CONCENTRATIONS OF HARMFUL SUBSTANCES IN ATMOSPHERIC AIR POPULATED PLACES. (Predel'no dopustimye kontsentratsii vrednykh veshchestv v atmosfernom vozdukhe naselennykh mest.) Gig. Sanit. 29, (5) 106-8, May 1964. CFSTI: PB165-500218

A list of maximum permissible concentrations of harmful substances in the atmosphere of populated areas in the USSR, as of June 30, 1963.##

03807

CALIFORNIA STANDARDS FOR AMBIENT AIR QUALITY AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.) California State Dept. of Public Health, Berkeley. 1959. 139 pp.

The salient points in the table of contents are: I. The standards and their significance. II. Technical bases for standards for the quality of ambient air. III. The technical bases for motor vehicle exhaust standards. In establishing the standards, an attempt was made to determine what effects the various pollutants were known to have at various levels of concentration on human health and comfort, on animals, and plants, and on visibility. The resulting air quality standards together with data concerning motor vehicle emissions and their reactions then became the bases for motor vehicle exhaust standards. The air standards do not establish a fine line below which is good air and above which is bad air. They indicate the approximate point at which air under some circumstances may produce undesirable effects.##

03810

METHODS OF MEASUREMENT OF AIR POLLUTION. Metodi di Misura dell'Inquinamento Atmosferico. Fuel Polvert (Milan) 5, (7-8) 217-21, 1956. 11.

The Organ of Cooperation and Economic Development (O.C.D.E.) with its headquarters in Paris, decided in January 1957, to create a "work group" to study the methods of measurement of atmospheric pollution. In 1963 a document was drafted by highly qualified specialists and technicians from all the member countries of (O.C.D.E.) and it deals with the measurement of smoke, anhydrides of sulfur, sulfuric acid, hydrocarbons and

fluorides. It is suggested that standard units of measurement be used, in the eye system. Smoke and particles of sulfur are measured in micrograms per cubic meter in U. S. and in mg. A method of measuring smoke in the atmosphere consists of passing a volume of air through a filter and measuring a color change in the medium. A correlation is obtained between the material collected in the machine and the color change based on a "standard smoke" measurement. Sedimentable materials are measured in milligrams per square meter per day. (Author summary)

03582

CALIFORN' STANDARDS FOR AMBIENT AIR QUALITY AND MOTOR VEHICLE
EXHAUST (TECHNICAL REPT.). (SUPPLEMENT NO. 1 ADDITIONAL
AMBIENT AIR QUALITY STANDARDS). California State Dept. of
Public Hlth, Berkeley. 20 pp., 1962.

Ambient air quality standards are tabulated. The basis for c[illegible]ne, hydrogen sulfide, and fluorides standards are rec[illegible]n terms of their effects on man, on vegetation, and on live[illegible]. The "adverse" level for ethylene was 0.5 ppm for 1 hr or [illegible] for 8 hr (damage to vegetation) and for sulfuric aci[illegible] 0.1 ppm for 1 hr (sensory irritation). Those forage cr[illegible] containing 30 to 50 ppm of fluorides, measured on a dry weight ba[illegible] are consumed over a long period, teeth and bones of cattle pe[illegible]ow changes, depending upon age, nutritional factors, and the a[illegible] of fluoride ingested.

03583

CALIFORNIA STANDARDS FOR AMBIENT AIR AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.). California State Dept. of Public Health, Berkeley. 1959. 15 pp.

These standards are presented as a yardstick which may be applied in maintaining and improving air quality. A graded set of ambient air standards was established which recognized the relationship between the seriousness of the effect of the pollutant and the urgency of control. Three levels of air pollutants were defined: adverse, serious, and emergency. The standards of motor vehicle exhaust contaminants are: hydrocarbons-275 ppm by volume as measured by a hexane-sensitized nondispersive infrared analyzer; carbon monoxide-1.5% by volume measured by a nondispersive infrared analyzer. The exhausts are to be measured during an eleven-mode operating cycle.

03584

J. A. Nega, G. E. Haas, and H. Wong-Woo

CALIFORNIA STANDARDS FOR AMBIENT AIR QUALITY AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.). (SUPPLEMENT NO. 1 CRANKCASE EMISSION STANDARD). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. Aug. 1961. 15 pp.

This standard was adopted by the State Board of Public Health on December 2, 1960. The following terms were also defined:

exhaust emissions; crankcase emissions; carburetor operating losses and carburetor hot soak losses; fuel tank emissions; and hydrocarbons. The standard for motor vehicle crankcase emissions is: hydrocarbons = 0.15% by weight of the supplied fuel, as measured during a three mode operating cycle by a heated-sensitized nondispersive infrared analyzer or by an equivalent method.##

05940

V. A. Dyomanov

NEW DATA ON LIMITS OF ALLOWABLE ATMOSPHERIC AIR POLLUTANTS. [In: Limits of allowable concentrations of atmospheric pollutants, Book 6.] U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 1-8. (1963). Russ. (Pr.)

This volume contains material discussed by the Committee on Sanitary Air Protection during the 1959 and 1960 sessions. The material contained in this volume is of heterogeneous character in its methodological presentations and completeness and finality of the reports. The Committee took the position that the level of methodology reached during the last period of investigation and the degree of reliability of results obtained did not represent the acme of perfection, and therefore, the proposed limits of allowable concentrations should be regarded as mere points of orientation for future studies, leading to more basic, more scientific and hence, more reliable limits of atmospheric air pollutants. In this connection it is the aim and purpose of this Committee to act as the stimulator, guide and directing agent leading into investigational channels based on the outlined principles. Air pollutants studied include formaldehyde, HCl aerosol, CS2 vapor, Pb, Hg, combined Cl2 and HCl gas, acetone, Cl and Diphyl (mixture of diphenyl and diphenyl oxide).#

05677

S. V. Shubin

MODERN APPROACH TO AIR DUSTINESS IN WORKSHOPS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 301-8, 1962. (Gigiena i Sanit.,) 24 (7) 50-5, 1959. Translated from Russian. (PB161; 62-11103)

Extensive data were accumulated during recent years on the study of the effect of different types of industrial aerosols. Based on the summary and evaluation of new data obtained from work institutes, university apartments and practicing physicians a list was prepared of the maximum permissible concentration of 55 dusts and aerosols. This list is presented and improvements in these standards are recommended.##

06085

Gol'dberg, R. S.

HYGIENIC CRITERIA OF AIR PURITY IN POPULATED AREAS (ACCORDING TO MATERIALS OF THE GENEVA SYMPOSIUM). [Iz kriteriyakh

gigienicheskoi otsenki atmosfernogo vozdukha naseleniya
sootv. [Fpo osteriolen Emperenoge atmosfernoi: Hyg. Sanit.
(Higiena i Sanit.), 30(1):90-96, Jan. 1965. Translated from
Russian.
CFSTI: TT 66-51033

In recent years there has been a steady increase in hygienic
research on air in populated areas. The need for planning of
measures for the control of atmospheric pollution is becoming
increasingly urgent. The necessity for an international
discussion of this subject, which would be a starting point for all
measures undertaken for the sanitary protection of urban air, led
the World Health Organization to convene an interregional
symposium in Geneva from the 6th to the 12th of August, 1961,
which was devoted to criteria for the quality of atmospheric air
and methods of its investigation. The discussion was centered on
the maximum permissible concentrations of harmful substances in
urban air. After a lively discussion, the symposium adopted
Prof. V. A. Ryazanov's proposal to establish a unified scale
of standards for the quality of air by merging together the Soviet
and American standards. In this way, an international scale
for the atmospheric pollution has been established for the first
time. The symposium drew up recommendations on the trend in
medical research on the effect of atmospheric pollution on the
health of the population, and a further elaboration of criteria and
standards of atmospheric air quality in populated areas.
Participants at the symposium also noted the necessity for the
further development of scientific research on the mechanism of
development of fibrotic pulmonary reaction induced by atmospheric
pollutants, and for studies of the reaction of the mucosa of the
respiratory tract, ciliary activity, etc. The symposium pointed
out the necessity for paying special attention to studies of new
synthetic chemicals which contaminate the atmosphere when
discharged by industrial enterprises or when used in the
household, as in the case of disinfectants.00

07079

MAXIMUM IMMISSION CONCENTRATIONS OF ORGANIC COMPOUNDS.
[Einfuhrung in die Richtlinien Maximale
Immissions-Konzentrationen.] Text in German. In: VDI
[Ver. Deut. Ings.] Richtlinien No. 2106, March 1966, p. 1-4,
Engl. transl: JPRS 3-7881-D, Oct. 14, 1966. VDI- [Journal
Deutscher Ingenieure] Kommission Reinhaltung der Luft-

The VDI Guide Lines for Maintenance of Purity of the Air
fall into the following groups: 1. Maximum Immission
Concentrations (MIK); 2. Dissemination of non-atmospheric
substances in the atmosphere; 3. Restriction of the discharge of
such substances; 4. Analyses and methods of measurement. For the
purpose of maintenance of air purity, MIK values (maximum
immission concentrations) are needed for numerous organic
compounds. They can be used as reference values for the
dimensioning of relevant installations and for evaluation of
measurement data in the immediate vicinity of sources of
contamination. If the MIK value for a substance is unknown it
is recommended that if there are no known reasons to the contrary
about 1/30 of the maximum allowable concentration value be taken as
a start. Technical societies recommending personnel to serve on
the VDI Commission on Maintenance of Purity of the Air are
listed. Neither the MIK or MAK values are listed.00

L. Standards and Criteria

07197

RECOMMENDATIONS FOR ALLOWABLE CONCENTRATION (1966.) Nihi Seiju Jikeng Kai - J. Japan Air Cleaning Assoc., Tokyo) 4(4):182-86, 1966. Text in Japanese.

A report is given by a committee of the Japanese Association of Industrial Health on "allowable concentration". The values of allowable concentration are worked out for a healthy man working 8 hr per day doing moderate work. Proper consideration must be given to cases in which more than 8 hr of exposure take place, more than one pollutant is involved, or the concentration of pollutants increases suddenly during the work schedule. Included is a discussion on dust measurement. It is important to measure dusts having a Stokes radius of less than 5 microns, especially at a height of 1 to 1.5 m from the ground. The relation between the source of dust and the point of measurement is illustrated.##

07289

Imagy, H. S.; S. B. Smolyanskii, L. N. Khotyanov, and B. V. Khunkelin

PROPOSED NEW SANITARY STANDARDS FOR PROJECTED INDUSTRIAL PRODUCTION PLANTS. Text in Russian. Gigiena Trudа i Prof. Zabolevaniya (6):5-11, 1957. Engl. transl. by B. S. Levine, U.S.S.R. Lit. on Air Pollut. & Relat. Occup. Dis., Vol. 3, p. 31-47, March 1960.
OTSPUT 1960-21188

New "construction standards and regulations" are now in the process of development; simultaneously the sanitary standards for the planned industrial enterprises are also being revised. The earliest sanitary standards regulating the construction of proposed industrial enterprises were issued in 1929. The new revision of the sanitary standards is the sixth in order of legally enacted documents in the field of industrial hygiene. In developing the proposed meteorological standards the position was taken that in all production and manufacturing plans temperature, humidity and air currents must be regulated in a synchronized manner. In the meteorological standards now in existence these factors are in a sense independent of one another; this caused the practicing sanitary-physician considerable difficulty in the enforcement of the prescribed standards for work rooms and shops in which heat and humidity were constantly liberated. Tables are presented showing: temperature, humidity and air current standards for work rooms in manufacturing and production industries; meteorological standards of air ventilation, temperature and air current velocity; are maximum allowable concentrations of poisonous gases, vapors and aerosols in the air of work rooms and shops of industrial manufacturing and production plants.##

07601

MacKenzie, V. G.

THE PHILOSOPHY OF ESTABLISHING AIR QUALITY CRITERIA AS GUIDES FOR THE SETTING OF AIR POLLUTION CONTROL STANDARDS IN THE

UNITED STATES. Preprint, Public Health Service, Washington, D. C., Division of Air Pollution, 7p., 1963. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-13, 1963, Paper No. ENG/AP/17.)

The magnitude and complexity of the philosophical, scientific and technological problems which confront governments and control agencies in their attempt to promulgate air quality criteria and to set ambient air standards for the control of air pollution are discussed.

07604

Bowman, August T., Jr.

ANALYSIS AND COMPARISON OF AVAILABLE DATA ON AIR QUALITY CRITERIA IN WESTERN COUNTRIES. Preprint, Washington Univ., Seattle, Dept. of Civil Engineering, 22p., 1963. 12 refs. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-13, 1963, Paper No. ENG/AP/11.)

Air quality standard-setting activities of Great Britain, West Germany, USSR, Czechoslovakia, and the United States are reviewed. In addition, an analysis and comparison is made of criteria and maximum allowable concentrations developed by these countries. Other countries of western Europe with the exception of West Germany and Czechoslovakia have not adopted air quality standards. In general the control of air pollution in Europe relies heavily upon regulations prohibiting the discharge of pollutants which may endanger the public health, be detrimental to safety, cause and public annoyance or constitute a public nuisance. Air quality standards for six specific gases have been developed by the Western German Commission. Czechoslovakia and Russia have established air quality standards for a large number of pollutants. In general their values are similar. In the United States definite progress in developing air quality standards has been made in only 3 states, are similar. In the United States definitive progress in developing air quality standards has been made in only two states, Oregon and California. The air quality standards in Oregon pertain only to suspended particulate matter. The most extensive development of air quality standards in the United States has occurred in California. Direct comparisons between ambient air quality standards of the various countries are not feasible because the objective and criteria are different and the selected time exposure period varies in each country. The USSR standards are based primarily on human sub-conscious thresholds while those of California, and to a great extent West Germany, are based on human conscious thresholds. This wide difference in standards is due in part to differences in medical and public health philosophy as to what constitutes a threat to health and well-being.

07605

Middleton, John T.

AIR QUALITY CRITERIA ASSOCIATED WITH VISIBILITY REDUCTION, HAZE AND DAMAGE TO VEGETATION. Preprint, California Univ., Riverside, Air Pollution Research Center, 14p., 1963. (Presented

and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963. Paper No. WHO/AP/15.)

Particulate loading of the atmosphere is primarily responsible for reduction in visibility. The amount of visibility reduction, in turn, is due to the nature of the particle. The criterion for visibility is perhaps best given in terms of visible distance at a specific relative humidity. Air quality criteria for soilage may be developed where specific contaminants have direct effects upon particular materials. Since in general the soilage of goods is a function of multiple actions, air quality criteria for soilage are difficult of description and perhaps of lessened general utility. Air quality criteria for visible effects of vegetation damage can be developed for those toxicants which have direct effects, such as sulfur dioxide, ethylene, nitrogen dioxide, peroxyacyl nitrates, and ozone. Air quality criteria for fluorides cannot now be determined because of the multiplicity of factors which control the rate of accumulation and the subsequent effect of fluoride upon plant tissues. Levels of fluoride responsible for damage to livestock can be established and a criterion based on this is feasible.

00001

Hunigen, E.; and W. Prietsch

PROBLEMS AND METHODS OF SOLUTION OF ELIMINATING NOXIOUS SUBSTANCES FROM INTERNAL COMBUSTION ENGINES. ((Probleme und Losungswege der Schadstoffbeseitigung bei Verbrennungsmotoren.)) Translated from German. Technik, (Berlin), 21(6):377-383, June 1966.

The composition of exhaust from internal combustion engines is discussed. Maximum permissible concentrations of harmful components are tabulated for five countries with standards for the following substances: hydrocarbons (benzene, etc.), aldehydes (formaldehyde, etc.), carbon dioxide, sulfur oxides, nitrogen oxides, lead (and tetraethyl lead), mineral oil mist, and carbon. Some equipment for the measurement of air pollutants is touched upon, including a description of an East German continuous sampling apparatus for hydrocarbons, CO, CO2, and O2.##

12029

COMMUNITY AIR QUALITY GUIDES. ALDEHYDES. Am. Ind. Hyg. Assoc. J., 29(5):505-512, Sept.-Oct. 1968. 53 ref.

The multi-disciplinary backgrounds and professional competencies within the American Industrial Hygiene Association have been utilized to the fullest in the preparation of a series of ambient air quality guides. These are intended to be concise, and therefore are offered as single compounds, recognizing that other factors such as potentiation, antagonism, or other effects associated with mixtures, will create special problems from place to place and from time to time, the effects of which must be individually evaluated. These guides are based on present scientific knowledge; as new data become available, the recommended threshold values are subject to change. The literature relating to the subject matter of each of the ambient air quality guide series is constantly being reviewed, and when indicated, new guides are prepared. (Author's Abstract)##

19575

Huenigen, Edmund and Wolfgang Priesach

ON THE PROBLEM OF LIMITING EMISSION OF TOXICANTS BY MOTOR VEHICLES IN EUROPE. (Zum Problem der Begrenzung der Schadstoffemission bei Kraftfahrzeugen in Europa). Text in German. Motortech. Z. (Stuttgart), 30(7):256-259, July 1969. 28 refs.

Maximum allowable emission concentrations in exhaust from motor vehicles in Europe are presently being worked out by an organization of the United Nations, the European Economic Commission. It has been suggested that the MAC values be determined by the 'European driving cycle exhaust gas test' (EFA). Maximum allowable concentrations in the atmosphere have been set by individual European countries. A table compares the values set by the German Democratic Republic, the German Federal Republic, and Russia and shows that the limits are far more stringent in the GFR. The toxicological importance of carbon monoxide, hydrocarbons, and nitrogen oxides in each country will form the basis for working out uniform European limits. Based on the MAC for CO and on the premise that the MAC values should correspond to the toxicological importance of the pollutants, the MAC ratio for CO, hydrocarbons, and nitrogen oxides is 1:1.9:0.1. As measurements show, at present only CO emissions need to be limited. The other toxicants will not be limited until more measurements have brought detailed information concerning the relationship between emissions and air pollution. Limitations of CO emissions during idling is urgently needed.

19772

Weaver, Neill R.

ATMOSPHERIC CONTAMINANTS AND STANDARDS. STATUS REPORT. J. Occupational Med., 11(9):459-461, Sept. 1969. 23 refs.

The Federal Air Quality Act of 1967 furnishes the methodology for the abatement of air pollution. Its provisions include the designation of air quality control regions and the issuance of air quality criteria and control technology documents, which will be followed by the promulgation of ambient air standards and emission standards at regional, state, and local levels. The atmospheric pollutants of current major concern are sulfur oxides, particulates, nitrogen oxides, hydrocarbons, oxidants, carbon monoxide, fluorine, and lead. Their toxic and other deleterious effects, exhibited at various concentration-time exposures, can be related to levels reached by the individual contaminants in the air of cities. While such an evaluation does not allow for possible interactions between pollutants, it appears that sulfur dioxide, oxidants, and carbon monoxide may be harmful to human health when the agents are concentrated, as in focal areas of emission or during sustained meteorologic inversions. Gains to be achieved by controlling these and other contaminants during non-peak conditions are probably derived from aesthetic, economic, and welfare benefits rather than health. Abatement procedures should eliminate rises in pollutant levels beyond the average ranges generally present in urban ambient air. (Author summary modified)

19869

Chapeau, B.

POLLUTION OF THE AIR BY AUTOMOBILES. EVOLUTION OF THE FORMULATION OF THE RULES OF THE EUROPEAN PLAN. COMPARISON OF LIMITS ANTICIPATED IN EUROPE AND THE U. S. A. (La pollution de l'air par les automobiles. Evolution de la reglementation sur le plan europeen. Comparaison des limites prevues en Europe et aux U. S. A.). Text in French. Pollut. Atmos. (Paris), 11(Special):124-32, Feb. 1969.

U. S. Federal Government measurements in 1970 of emissions from automobiles on a standard U. S. run will be calculated from a given formula. In European practice, measurements are made on a European standard run. A U. S. value for carbon monoxide of 23 gm/mile is equivalent to 124 gm/mile in European calculations; a U. S. hydrocarbon figure of 2.1 gm/mile corresponds to the European 9.52 gm/mile. Germany, Italy, France, and Sweden have together proposed limits for emissions varying linearly with I, the vehicular mass in kg. The best linear fit of exhaust values in the European run is: Vol(liters) equals 1180 + 2.9 I. The limits for prototype cars in a standard run are 80.98 + .07576 I (in grams) for carbon monoxide, and 8 + 0.003 I (in grams), for hydrocarbons. For production control, the limits are 20% higher for CO and 30% higher for hydrocarbons. Means for satisfying these requirements, especially for cars with cylinders of less than 819 cc cu, are not yet available. Proposed techniques include electronic fuel injection, carburetor adaptation for town driving, and two-performance carburetion. Richness should be kept low in deceleration and idling, and ignition delayed. Non-Air-Ox catalysis is generally considered too expensive for application. Future research work is expected to be on design of cylinders, wall temperature, internal turbulence, spark gaps, high frequency discharges, valves, and exhaust. Oxides of nitrogen must be considered but are less dangerous in Europe than in the U. S. for climatic reasons. Increasing European and U. S. cooperation is anticipated.

19719

COMMUNITY AIR QUALITY GUIDES, ETHYLENE. Am. Ind. Hyg. Assoc. J., 29(6):627-631, Nov. - Dec. 1968. 24 refs.

The multi-disciplinary backgrounds and professional competencies within the American Industrial Hygiene Association have been utilized to the fullest in the preparation of a series of ambient air quality guides. These are intended to be concise. To be concise they are offered as single compounds, recognizing that other factors such as potentiation, antagonism, or other effects associated with mixtures, will create special problems from place to place and from time to time, the effects of which must be individually evaluated. These guides are based on present scientific knowledge; as new data becomes available, the recommended threshold values are subject to change. The literature relating to the subject matter of each of the ambient air quality guide series is constantly being reviewed, and when indicated, new guides are prepared. (Author's Abstract)

46518

California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation

NEW AND REVISED MOTOR VEHICLE STANDARDS ADOPTED. Clean Air Unsct., 6(8):1-27, Dec. 1964.

California's 1970 emission standards for motor vehicles reduce hydrocarbon exhaust levels from 275 to 180 ppm by volume and carbon monoxide exhaust levels from 1.5 to 1.0 percent by volume. The crankcase hydrocarbon standard is lowered from 0.15 to 0.10 percent of the supplied fuel. For the first time the following standards are included for fuel tank and carburetor hot soak emissions respectively: 6 g/day; and 2 g/day. Approximately 95% of hydrocarbon losses are now covered by emission standards. However, further improvements in the standard are anticipated. It is hoped that the hydrocarbon standards can be eventually stated in terms of the reactive compounds producing photochemical smog. Also under consideration is a standard for nitrogen oxides. As the result of a prolonged smog attack in September and October 1964, three Southern California cities experienced more than 20 'adverse' days when the total oxidant exceeded 0.15 for one hour or longer. Unless emissions of pollutants, particularly those from automobiles, are curbed, further severe smog episodes will occur. The State Motor Vehicle Pollution Control Board has given its approval to the Chrysler exhaust control system. Current studies of carbon dioxide contamination from engine compartments show CO concentrations in closed cars of 100 to 200 ppm. Although exposure to these levels for two hours or longer could adversely affect a commuter's carboxyhemoglobin level, the CO levels are not likely to be influenced by controlling hydrocarbon and carbon monoxide emissions with afterburners. Levels of oxidants, nitrogen oxides, carbon monoxide, and sulfur dioxides recorded by state monitoring stations are tabulated.

M. BASIC SCIENCE AND TECHNOLOGY

00001

A. P. Altshuller and I. R. Cohen

ATMOSPHERIC PHOTOOXIDATION OF THE ETHYLENE-NITRIC OXIDE SYSTEM.
Intern. J. Air Water Pollution, Vol. 8: 611-618, 1964.

Because ethylene is not only a phytotoxicant but also is reactive in the photochemical type of air pollution, a detailed study has been made of the photooxidation of ethylene-nitrogen oxide mixtures in air. The effects were determined of varying the concentrations of ethylene between 0.1 and 5 ppm and of nitric oxide between 0.2 and 10 ppm on the rate of ethylene consumption, the rate of nitrogen dioxide formation and on the yields of various products. The greater part of the ethylene consumed could be accounted for in the products as formaldehyde or carbon monoxide. It was not possible to obtains nitrogen balance in this system, although a small amount of methyl nitrate was produced. Ethylene-nitrogen oxide mixtures react rapidly in static irradiations at reactant concentrations below 0.5 ppm. For example, photooxidation of a mixture initially containing 0.2 ppm of ethylene and 0.2 ppm of nitric oxide resulted in a nitrogen dioxide peak in 30 min and half conversion of ethylene in about 80 min. At equal ratios of reactants, ethylene-nitric oxide mixtures actually are more reactive at lower concentrations of reactants. In order to explain the experimental results it appears that free radical chain reactions must be postulated. A discussion of various mechanistic reaction steps is given. (Author)00

00039

J.J. Bufalini A.P. Altshuller

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL SMOG REACTIONS.
Intern. J. Air Water Pollution, Vol 7:769-771, 1963.

Results of measurements made for the photo-oxidation of trans-2-butene-nitric oxide in air and for 1,3,5-trimethylbenzene-nitric oxide in air are discussed. The initial concentrations of the reactants in the two systems were as follows: trans-2-butene, 10 ppm; nitric oxide, 9.2 ppm; 1,3,5-trimethylbenzene, 6 ppm; nitric oxide, 3 ppm. The conversion times for both systems decreased by approximately a factor of two and the rates increased by a factor of two when the temperature was increased from 20 to 40 degrees. The conversion time of the nitrogen dioxide maximum and the rate of half-conversion of nitric oxide to nitrogen dioxide are two independent measures of reactivity which give good agreement on a relative basis. Similarly which give good agreement on a relative basis. Similarly on a relative basis, good agreement

is obtained on the times at which the hydrocarbon reaches half of its initial concentration and the normalized rates at these times in the reaction although they do represent somewhat different measures of reactivity. The results from these two systems should not be taken as indicating that temperature changes are independent of the nature of the hydrocarbon used as a reactant. The investigation showed that temperature difference of a few degrees can cause measurable changes in photo-oxidation rates.##

00058

B.S. Tipson

REVIEW OF OXIDATION OF POLYCYCLIC, AROMATIC HYDROCARBONS. National Bureau of Standards, Washington, D.C., Division of Physical Chemistry. (PB? Rept. 0363.) (NBS with PHS support.) May 27, 1954. 89pp.

A survey has been made of the literature on the oxidation of polycyclic, aromatic hydrocarbons. Information has been assembled on (1) the oxidants effective in the oxidation of such hydrocarbons, (2) the relative reactivity of the hydrocarbons, (3) the conditions under which oxidation proceeds, (4) the chemical mechanisms involved when such oxidations occur, and (5) the products formed. (Author)##

00069

C. Orr, Jr., W.P. Hendrix, F.K. Hurd, W.J. Corbett

INTERACTION OF SUBMICRON SNOW PARTICLES AND VAPORS (FINAL REPT.). Georgia Inst. of Tech., Atlanta, Engineering Experiment Station. Dec 31, 1961. 99 pp.

The purpose of this investigation was to determine the physical effect of organic solvent vapors on aerosols having particle radii in the range of 0.01 to 0.1 micron. To accomplish this, an ion counter was employed to determine the particle size distribution of various aerosols both in the presence of pure gases and in the presence of gases containing foreign vapors. The size distributions were established as functions of vapor concentrations. Systems consisting of aerosolized particulates (listed first) and a vapor (listed second) such as ammonium iodide and alcohol, camphor and alcohol, poly(methyl methacrylate) and methyl ethyl ketone increased in particulate size with an increase in vapor concentration below relative humidities of 100% while systems of stearic acid and turpentine, carbon and benzene, graphite and benzene, paraffin and benzene, and naphthalene and gasoline showed no size change below the saturation point. Except for the systems of graphite and benzene and carbon and benzene, the particulates were soluble to a measurable extent in the liquid phase of the vapor with which they were paired. From the results of this

investigation it may be concluded that: (1) Particulate aerosols that are soluble in volatile organic solvents increase in size with increase in solvent vapor concentrations. The extent of the size change may be predicted from theoretical considerations. (2) In general, the greater the solubility of the aerosol material the lower will be the relative humidity at which significant growth will occur. (3) For materials with a relatively low solubility (less than approximately 5% by weight) relative humidities in excess of 100% are required for growth if the nuclei size is of the order of 0.01 micron diameter. (4) An ion counter affords an excellent means for analyzing aerosol particulate radii in the range from 0.01 to 0.1 micron.##

00101

R. P. Routsounkos and R. Kobe

CATALYTIC COMBUSTION OF HYDROCARBONS. IV. EFFECT OF PREPARATION METHOD ON CATALYTIC ACTIVITY. California Univ., Los Angeles. Dept. of Engineering. (Report No. 64-12.) Feb. 1965. 55 pp. CFSTI: AD 601026

Five types of CuO catalysts were prepared in this study by varying the amount of KOH used in the precipitation of $Cu(OH)_2$ from aqueous $Cu(NO_3)_2$ solutions. The rate of the catalytic combustion of ethylene was used as a measure of the activity of these catalysts. Overall rate expressions of the form r equals kp sub E to the Nth power were used to correlate the experimental data. An average reaction order of 0.60 provided the best correlation of all the kinetic data. The experimental data indicated that the temperature required for a given conversion decreased with increasing amounts of KOH used in the preparation of the catalyst (up to 25% greater than stoichiometric). The BET surface area and mechanical strength of the catalyst increased with increasing KOH used. Using the specific rate constant per unit surface area as a measure of activity it was found that the catalytic activity of CuO decreased with increasing pH (or amount of KOH used). Comparison of the activity of the stoichiometric catalyst prepared in this investigation with the activity of cupric oxide-alumina (1:1) catalyst studied by Aucouturier for the same reaction proved greatly in favor of pure CuO. (Author)##

00119

W. E. Wentworth, E. Chen, and J. E. Lovelock

THE PULSE-SAMPLING TECHNIQUE FOR THE STUDY OF ELECTRON-ATTACHMENT PHENOMENA. J. Phys. Chem. 70, (2) 445-50, Feb. 1966.

A study of the parameters characterizing the electron-capture detector operated in the pulse-sampling mode was carried out. The pulse width, approximately 0.5 microsec., applied voltage, -50v., and the pulse period approximately 1000 microsec., necessary to

collect all of the electrons and to achieve a steady state when argon-10% methane is used as a carrier gas were determined. It was assumed that the electrons acquired a thermal distribution when no potential was applied to the cell and that the results were independent of the pulse potential examined up to 80 v. A kinetic model of the processes occurring within the electron-capture detector operated in the pulse-sampling mode has been proposed. For the case in which the electron-capturing species is capable of forming a stable negative ion (in contrast to dissociative electron capture), the system of differential equations was solved using the steady-state approximation. From this solution, one can obtain the previously defined electron capture coefficient in terms of the constants for the processes proposed in the model. In certain cases one can obtain values for the rate constants and/or the electron affinity of the molecule from the temperature dependence of this electron-capture coefficient. Evidence is given for the validity of the proposed model, and the magnitude of the rate constants and the electron affinities are given for several aromatic hydrocarbons. (Author)##

00120

R. Walsh, B. A. Golden, and S. W. Benson

THE THERMOCHEMISTRY OF THE GAS PHASE EQUILIBRIUM IS PLUS (CH3)3CH=(CH3)2CCH2 PLUS HI AND THE HEAT OF FORMATION OF THE NEOPENTYL RADICAL. J. Am. Chem. Soc. 88, (4) 650-6, Feb. 20, 1966.

With the aid of a spectrophotometer modified for high-temperature systems, the equilibrium constant for the reaction (CH3)3CH plus I2 at equilibrium with (CH3)2CCH2I plus HI was measured over the temperature range 210-190 degrees. Thermodynamic calculations gave a value of plus 30.43 plus or minus 0.12 Kcal/mole for the heat of formation of (CH3)2CCH2I (g). Crude kinetic data were obtained within the range of 210-200 degrees. Assuming the rate-controlling step in the initial stages of reaction to be I plus (CH3)3CH at equilibrium with (CH3)2CCH2 plus HI, Arrhenius parameters were calculated and it was found that the heat of formation for (CH3)2CCH2 (g) = 48.1 plus or minus 4.1 Kcal/mole and the bond strength of (CH3)2CCH2-H at 298 degrees = 88.2 plus or minus 4.1 Kcal/mole, in good agreement with values from recent kinetic studies.##

00128

R. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. VI. THERMODYNAMIC DATA FROM EQUILIBRIUM STUDIES OF THE GEOMETRICAL AND POSITIONAL ISOMERIZATION OF N-PENTENES. J. Am. Chem. Soc. 88, 236-40, Jan. 20, 1966.

The equilibrium of the iodine catalyzed gas phase isomerization of 1-pentene and 2-pentene was studied over a temperature range

from 118.5 to 145.9 degrees. The measured values for constants of both the positional and the geometrical isomerizations yield straight lines when plotted vs. 1/T(degree K). Entropy and enthalpy values were derived by application of least-square fits of data to linear equations using a standard computer regression program yield with standard errors (for a mean temperature of 500 K.) The data can be equally well fitted to both linear and quadratic equations. The data for the heats of isomerization are in very good agreement with values calculated from the data on the heat of formation reported by Prosen and Rossini and quoted in the API tables. The entropy differences between the isomers obtained from the direct experimental data agree reasonably well with the comparative estimates of Kilpatrick, et al. Values for partial group contributions and corrections thereof were calculated from the data of this work and results reported earlier from related studies on n-butenes and 1,3-pentadienes. They are in excellent agreement with earlier estimates.##

00161

C. A. Arrington, W. Brennan, G. P. Glass, J. V. Michael, and H. Niki

REACTIONS OF ATOMIC OXYGEN WITH ACETYLENE (I) KINETICS AND MECHANISMS. Harvard Univ., Cambridge, Mass., Dept. of Chemistry. Mar. 1965. 20 pp.
CFSTI: AD 466129

The room temperature reaction of acetylene with atomic oxygen has been studied in a moderately fast flow system. The course of the reaction was followed using both the Bendix T.O.F. Mass Spectrometer and a photometric method. The major products of the reaction were carbon monoxide and hydrogen. Large amounts of atomic hydrogen were also observed. The reaction scheme presented is consistent with the results obtained. The rate of the overall reaction is determined by the first initial step in which atomic oxygen adds to acetylene to yield an excited complex which then undergoes unimolecular decomposition to give triplet methylene. The rate constant for this initial reaction was measured, at room temperature as (8.9 plus or minus 2.0)x10 to -14th power cc./molecules, sec. The activation energy was less than 1 kcal./mole. Experiments with acetylene-d2 have established the specific reactions which constitute the major pathway by which triplet methylene, produced in the first initial step is consumed. (Author abstract)##

00190

R. D. Doepker and P. Ausloos

GAS-PHASE RADIOLYSIS OF CYCLOPENTANE. RELATIVE RATES OF H/(+)-TRANSFER REACTIONS FROM VARIOUS HYDROCARBONS TO C5H9(PLUS). J. Chem. Phys. 44, (5) 1951-8, Mar. 1, 1966.

The radiolysis of cyclo-C5H10 was investigated in the presence of various saturated and unsaturated perprotonated hydrocarbons .#

on the basis of the isotopic analysis of the propanes formed in these mixtures and several other experimental observations it is concluded that the C3H6(plus)ion, which is the major ion produced in the fragmentation of C5H10(plus), reacts with various saturated hydrocarbons (RH2) as follows: (a) C3H6(plus) plus RH2 yields CH3CHRCH2H plus R(plus). Rates of this process relative to that of the reference reaction (b) C3H6(plus) plus cyclo-C5H10 yields C3H8(plus) were measured with an accuracy of better than 2%. It is suggested that the saturated hydrocarbons also transfer an H(-)ion to C3H6(plus) according to the following reaction (c) C3H6(plus) plus RH2 yields C3H6H plus RH(plus). Although in agreement with theory the total rate of reaction of C3H6(plus) with RH2 is generally seen to increase with an increase in molecular weight of RH2, there are appreciable variations in the rates of the H2(-) transfer reaction (a) versus that of the H(-)-transfer reaction (c) with a change in structure of the hydrocarbon molecule. Reaction (c) is usually favored when RH2 is a branched hydrocarbon, except for neopentane which is entirely unreactive toward C3H6(plus). Unsaturated hydrocarbons do not transfer H2(-)ion to C3H6(plus) but probably undergo a condensation-type process. The radiolysis of cyclopentane was also investigated in the presence of O2, NO, and (CH3)3N. It is demonstrated that the C3H6(plus) and C5H10(plus)ions transfer their charge to NO, or (CH3)3N and that a pressure of 20 torr approximately 20% of the parent ions undergo ring opening prior to the approximately 20% of the parent ions undergo ring opening prior to the charge-transfer process. (Author)##

00231

J.H. Newton

EVIDENCE FOR A FUNCTIONAL DISULPHIDE IN PHOTOPHOSPHORYLATION. Nature, 195(4839):369-371, July 28, 1962.

The investigation reported here was prompted by results of immunochemical studies on chromatophores of photosynthetic bacteria and by the finding that the photochemical apparatus of Rhodospirillum rubrum yielded serologically univalent fragments after disulphide scission. The presence of these cell particles of a repeating antigenic sub-structure with individual determinant groups spaced between each pair of disulphides was therefore indicated. Production of the univalent subunits of chromatophores can be brought about by treatment with sulphite, heavy metals under alkaline conditions, mercaptans, or sonic oscillation. Since the antigens under consideration are placed in the chromatophore during photosynthetic growth, and since the photophosphorylation system appears in the chromatophore under these conditions, the possibility of a functional involvement of these structural disulphides in photophosphorylation has been examined. (Author's abstract)##

00238

E.R. Stephens, F.R. Burleson, E.A. Cardiff

THE PRODUCTION OF PURE PEROXYACYL NITRATES. J. Air Pollution Control Assoc, 15, (3) 87-9, Mar, 1965. (Presented at Sixth Conference on Methods in Air Pollution Studies,

California State Dept. of Public Health Berkeley, Jan. 6-7, 1966.)

Three different reaction systems have been used to prepare the first three members of the PAN homologous series Two of these involve photolysis by ultraviolet black light lamps and one is a dark reaction. All are carried out in the gas phase: (1) Photolysis of dilute (100 ppm) mixtures of a symmetrical olefin (e.g., 2 butene) with either nitric oxide or nitrogen dioxide in dry oxygen or air. This was the original method and it most closely resembles the way in which these compounds are formed in polluted atmospheres. (2) Photolysis of dilute alkyl nitrite in oxygen. This is the preferred method for PAN and PPN. It was successful for the preparation of the four carbon homologue. (3) The dark reaction of the appropriate aldehyde with NO2 and O3 at low concentration in oxygen. This is the preferred method for the preparation of the four carbon homologue. The starting material is n-butyraldehyde. In all cases the was a gas chromatographic procedure is used for purification. (Author)##

00353 e

A. Padwa D. Crumrine

PHOTOLYTIC DESULPHURIZATION OF DIBENZOYLSTILBENE EPISULPHIDE. Chem. Commun. (21) 506-7, Nov. 10, 1965.

The photo-extrusion of sulphur from dibenzoylstilbene episulphide (I) by ultraviolet light filtered through Pyrex glass is described. Irradiation of trans-dibenzoylstilbene episulphide (I) with a Pyrex filter in benzene as solvent afforded a mixture of cis- and trans-dibenzoylstilbene (II and III) in high yield. The photolysis was followed by infrared spectroscopy and was essentially complete in 30-60 min. The photodesulphurization is markedly stereospecific. Consideration of the isomeric distribution of the olefin obtained in a number of photolyses and the irradiation time demonstrated at least 90% stereoselective removal of sulphur from (I) to give (III). Increasing the time of the irradiation gave a slightly higher proportion of the cis-olefin but resulted in a diminished overall yield of the olefinic material. The lower yields can be attributed to a competing side reaction which predominates at longer photolysis time. The loss of sulphur from the episulphide upon photolysis is most simply explained by assuming a cleavage of the C alpha-S bond of the three-membered ring followed by loss of atomic sulphur. The light absorbed by (I) possesses sufficient energy to effect a carbon-sulphur bond cleavage.##

00355

A. Padwa

PHOTOCHEMICAL TRANSFORMATIONS OF A BETA, GAMMA EPOXY KETONE. J. Am. Chem. Soc. 87, 4205-7, 1965.

In contrast to exhaustive studies concerned with the photochemistry of alpha, beta epoxy ketones there has been no attempt, to date, to examine the phototransformations of the

related keto, gamma acyl oxide system. Although a formally analogous rearrangement occurs, the mechanism of the transformation is markedly different.
trans-1,4-Diphenyl-3-buten-1-one oxide (I) was prepared by trans-1,4-diphenyl-2-butene-1,4-diol with p-toluenesulfonic acid. Treatment of I with m-chloroperbenzoic acid afforded, in essentially quantitative yield, trans-1,4-diphenyl-3,4-epoxy-butan-1-one (II). The irradiation of II was conducted using an internal water-cooled mercury arc lamp with a Pyrex filter to eliminate wave lengths below 280 millimicrons. The photolysis was followed by withdrawal of small samples at fixed intervals and examination of these by thin-layer chromatography. Upon irradiation of 500 mg. of II in benzene for 8 hr., the spot on a thin-layer plate due to II had completely disappeared and three new spots had appeared in its place. Chromatography of the crude photolysis mixture afforded 2,5-diphenylfuran (27%) and dibenzoylethane (III, 10%) as the only isolable products. The formation of 2,5-diphenylfuran was shown to be the result of a ground-state acid-catalysed rearrangement of II. By using scanning liquid-liquid partition chromatography the crude photolysis mixture could be resolved into two major components. In addition to dibenzoylethane (III, 10%), an alcohol was obtained. The elemental analysis of this component IV indicates that it is an isomer of II. The molecular weight is consistent with a monomeric unit. The high-dilution IR spectrum (CHCl3) of IV shows a sharp strong intramolecular hydrogen bond; the IR band corresponding to a non-bonded hydroxyl stretching frequency was absent. The fact that absorption due to this bond is strong and is invariant with concentration suggests that the hydroxyl group of IV is cis to the oxide ring. The ultraviolet spectrum (95% ethanol) with maxima IV is converted rapidly to dibenzoylethane by chromatography on Woelm base-washed alumina but can be recovered unchanged from liquid-liquid partition chromatography.**

00156

H. Kristinsson G. W. Griffin

PHOTOCYCLISATION OF 1,1-DIMETHYL-1-PHENYLBUTENE-1. A NOVEL PHOTOINDUCED 1,2-METHYL MIGRATION. J. Am. Chem. Soc. 88, (2) 378-9, Jan. 20, 1966.

The first example of a photoinduced 1,2-methyl migration in a simple hydrocarbon system is reported. A mixture (1:1) of cis- and trans-1,1-dimethyl-1-phenylbutene-1 (Ia and Ib, respectively) was synthesized. A photoequilibrium between Ia and Ib was established rapidly under the irradiation conditions, and therefore separation was deemed unnecessary. Irradiation of I in benzene (0.1 M) for 70 hr afforded almost exclusively 2,1-dimethyl-2-phenylbutene-1 (II). The primary products in this photoreaction are presumably cis- and trans-2,2,1-trimethyl-1-phenylcyclopropane (IVa and b, respectively). That IVa and IVb are intermediates in the conversion of I to II is supported by the observation that the isomeric cyclopropanes (IVa and IVb) are completely converted to the olefin II after only 24-hr irradiation in benzene (0.1). It is clear in view of this result why the cyclopropanes do not accumulate upon photolysis of I. It is assumed that the conversion of I to IV occurs in a concerted fashion with methyl migration accompanying

cyclization. A mechanism involving formation of a common transitory intermediate which collapses to II directly or alternatively to IVa and IVb cannot be excluded, however, even though a pathway exists for facile conversion of IV to II.##

00565

Story, Paul R. and John R. Burgess

OZONOLYSIS. EVIDENCE FOR CARBONYL OXIDE TAUTOMERIZATION AND FOR 1,3-DIPOLAR ADDITION TO OLEFINS. J. Am. Chem. Soc., 89(22):5726-5727, Oct. 25, 1967. 12 refs.

Evidence of the existence of carbonyl oxides is based on their reaction with alcohols to form alkoxy hydroperoxides. Studies report evidence for 1,3-dipolar addition of carbonyl oxides to aldehydes but none such for the similar addition to olefins. Evidence is presented for 1,3-dipolar addition of a carbonyl oxide to an olefin and further, that the olefin is a vinyl hydroperoxide, formed in the ozonolysis reaction by tautomerization of the carbonyl oxide. Upon examination of the reaction mixture from the ozonolysis of tetramethylethylene with gas and liquid chromatography, one of the major products was found to be peroxyhydroperoxide. A structural assignment was given to the compound on the basis of information obtained from the infrared absorption and nuclear magnetic resonance measurements along with observation of various other reactions. It was also established that the other product obtained from the ozonolysis reaction was hydroxyacetone. The isolation of hydroxyacetone and peroxy hydroperoxide was thought to be good evidence for the tautomerization and subsequent rearrangement of carbonyl oxides. However, the structure assigned as peroxy hydroperoxide has now been found to be incorrect. Although the evidence for carbonyl oxide tautomerization stands, the evidence for carbonyl oxide addition to an olefin is not valid. The structures are presented along with newly found proof for elimination of the original one.##

00608

F. R. Allen, J. N. Pitts, Jr.

THE VAPOR PHASE REACTION OF METHYL RADICALS WITH CROTONALDEHYDE. J. Phys. Chem., 70(5):1691-1699, June 1966. 11 refs.

The reaction of crotonaldehyde (but-2-en-1-al) with methyl radicals (produced by the photolysis of acetone at 3130 Å) at temperatures in the range 120 to 250 degrees has been investigated. The major products of the reaction were carbon monoxide, propylene, four isomeric butenes, methane, hydrogen, and ethane in decreasing order of abundance. The mechanism of the formation of products is discussed. An expression for the rate constant of the displacement reaction is presented.##

00770

E. Sawicki, T.W. Stanley, H. Johnson

QUENCHOFLUOROMETRIC ANALYSIS FOR POLYNUCLEAR COMPOUNDS. Mikrochim. Acta, Suppl. 1, 178-192, 1965.

Quenchofluorometry should have a wide range of application, especially in the anaylsis of polycyclic compounds. By varying the solvent system and thus its particular type of quenching effect fluorescence methods of analysis are made much more highly selective. The following types of determinations can be made: aza heterocyclic hydrocarbons in the presence of other polynuclear compounds and vice versa, fluoranthenic hydrocarbons in the presence of other types of aromatic hydrocarbons, aza heterocyclic hydrocarbons in the presence of some aromatic amines and vice versa, and aza heterocyclic hydrocarbons in the presence of imino heterocyclic hydrocarbons and vice versa. (Authors' summary)##

00869

E. Sawicki, T.W. Stanley, W.C. Elbert

THE APPLICATION OF THIN-LAYER CHROMATOGRAPHIC AND SPECTRAL PROCEDURES TO THE ANALYSIS FOR AZA HETEROCYCLIC HYDROCARBONS IN COMPLEX MIXTURES. Occupational Health Rev. 16, (3) 8-16, 1964.

Procedures for the separation and characterization of aza heterocyclic hydrocarbons present in complex mixtures have been developed. Of the several hundred compounds present in the basic fraction of coal tar pitch, the following aza heterocyclic hydrocarbons have been characterized by easily reproducible procedures: benzo(h)-quinoline, methylbenzo(h)quinoline, dimethyl(or ethyl) benzo(h)-quinoline, 10-alkylbenzo(h)quinoline, benz(c)-acridine, dimethyl(or ethyl)benz(c) acridine, dibenz(a,h)acridine, 10H-indeno(1,2-b)quinoline, acridine, phenanthridine, indeno(1,2,3-ij)-isoquinoline, benzo(f)quinoline, alkylbenzo(f)quinoline, benzo(lmn)-phenanthridine, benz(a)acridine, alkylbenz(a)acridine, and dibenz-(a,j)acridine. Coal tar pitch was used as the standard material in the analyses because it is readily available, contains a large assortment of basic compounds and carcinogens, and is found in high concentrations in air near outdoor tarring operations. The following separation procedures were used: column chromatography (alumina-pentane with increasing amounts of ether followed by increasing amounts of acetone), circular paper chromatography (formamide: water, 15:85), thin-layer chromatography (alumina - pentane: ether, 19:1) and thin-layer chromatography (cellulose - formamide:water, 35:65). The following characterization procedures were used: ultraviolet absorption spectrophotometry of an eluant or an extract, quenchofluorometry, spectrophotofluorometry of an extract or an eluant, spectrophotofluorometry on the thin-layer plate or on paper, spectrophotophosphorimetry on paper, color tests, and observation of fluorescence colors on the thin-layer plate or on paper before and after trifluoroacetic acid fuming. The described procedures are used directly in the analysis of airborne particulates and air pollution source effluents for polynuclear aza heterocyclic hydrocarbons. (Author abstract)##

00916

E. J. Baus, J. K. S. Wan, and J. N. Pitts, Jr.

REACTIVITY OF EXCITED STATES. INTRAMOLECULAR HYDROGEN ATOM ABSTRACTION IN SUBSTITUTED BUTYROPHENONES. J. Am. Chem. Soc., 88(12):2652-2659, June 20, 1966. (Presented in part at the Symposium on Structure and Photochemistry of Excited States, 149th National Meeting of the American Chemical Society, Detroit, Mich., Apr. 1965; and the IVth International Congress on Photobiology, Oxford, England, July 1965.)

The quantum efficiency of photocycloelimination of ethylene ("type II process"), Phi sub II, from butyrophenone and several para-substituted derivatives is highly sensitive to the electron-donating character of the substituent and to the nature of the lowest triplet state. Thus at 3130 A, 25 degrees, and in several solvents, Phi sub II drops from 0.82 and 0.19 in butyrophenone and p-methylbutyrophenone, respectively, to 0.00 in the p-NH2, p-OH, and p-C6H5 derivatives. Energy-transfer and spectroscopic studies indicate that the photoreaction proceeds from the lowest triplet state of these ketones and that this state is n, pi (asterisk) for reactive and Pi, Pi (asterisk) for unreactive ketones. p-Bromo- and o-hydroxybutyrophenone do not undergo photocycloelimination. The former eliminates bromine atoms with a quantum yield of 0.25. The latter photoenolizes in a reaction similar to that observed for o-hydroxy- and o-methylbenzophenone. The photocycloelimination reaction is temperature dependent with an activation energy of about 2 kcal/mole for butyrophenone. (Author abstract)##

00917

E. J. Baus and J. N. Pitts, Jr.

INTRAMOLECULAR ENERGY TRANSFER; PHOTOELIMINATION OF HALOGEN ATOMS FROM AROMATIC KETONES. J. Chem. Phys., Vol. 70:2066-2067, 1966.

Photochemical reaction of bromine atom photoelimination in p-bromobutyrophenone, a previously unreported reaction in ring-substituted aromatic ketones, is discussed. The results obtained indicated that photoelimination of halogen atoms was quite general for aromatic ketones substituted in the ring with Br and I.##

00925

J. K. S. Wan, R. H. McCormick, E. J. Baus, and J. N. Pitts, Jr.

THE ROLES OF MOLECULAR STRUCTURE AND ENVIRONMENT IN THE REACTIVITY OF EXCITED STATES. J. Am. Chem. Soc. 87(20):4609-4616, Oct. 20, 1965. (Presented at the Symposium on Structure and Photochemistry of Excited States, 149th National Meeting of the American Chemical Society, Detroit, Mich., Apr. 1965.)

The importance of molecular structure and environment in the reactivity of excited states was discussed and demonstrated by a study of two model photochemical systems in both conventional liquid medium and solid potassium bromide matrix. The two photochemical systems are the dimerization of anthracenes, which is a bimolecular reaction involving a Pi, pi (asterisk) excited singlet and a ground-state monomer, and the cyclo-elimination process (type-II split) of butyrophenones, which is a unimolecular decomposition involving an n, pi(asterisk)triplet state. (Author abstract)##

01026

Foote, J.K., R. H. Mallon, and J. N. Pitts, Jr.

THE VAPOR PHASE PHOTOLYSIS OF BENZENE AT 1849 A. J. Am. Chem. Soc., 88(16):3698-3702, Aug. 20, 1966. 28 refs.

The quantum yield of disappearance of benzene vapor at 1849 degrees is 0.9 plus or minus 0.1. The major irradiation product appears to be a valence isomer of benzene, tentatively identified as "benzvalene". Addition of diluent N2 reduces the rate of formation of the product but, up to 50mm total pressure, increases its maximum concentration. Small amounts of fragmentation products, i.e. methane, ethane, ethylene, and acetylene, are also observed as well as considerable amounts of polymeric or carbonaceous deposit on the cell walls. These products may be formed in the secondary photolysis of "benzvalene". (Author abstract)##

01034

E. Sawicki and H. Johnson

THE VARIOUS QUENCHING EFFECTS IN THIN-LAYER CHROMATOGRAPHY - APPLICATION TO AIR POLLUTION. J. Chromatog. Vol. 21:192-198, 1966.

Eight fluorescence quenching techniques of value in the direct analysis of spots on thin-layer chromatograms are discussed. Use of an insoluble quencher in the adsorbent is of benefit in the selective analysis of fluorescent compounds. It is predicted that with the help of polymeric materials containing nitro, phenolic, amino, anilino, thiocarbonyl, ketonic carbonyl, hydrazine, azo, and nitroso groups quick highly selective methods of direct quenched fluorometric analysis of spots on a plate will be possible for compounds containing various types of functional groups. This type of functional group analysis should approach the simplicity of colorimetry. Examples are given of the application of some of these techniques to the analysis of urban air pollutants. The following compounds have been readily and quickly characterized by the fluorescence quenching techniques: acridine, benz(a)acridine, benz(c)acridine, 7H-benz(de)-anthracen-7-one, benzo(f)quinoline, benzo(h)quinoline, phenalen-1-one and xanthen-9-one. All of these compounds have been found in the examined polluted urban atmospheres. (Author summary)##

01166

N. C. Wani and S. G. Levins

PHOTOCHEMISTRY OF 2-ALKYLAMINOPHENOXAZ-3-ONES. North Carolina State Univ., Raleigh, Dept. of Chemistry. 1965. 17 pp.
CFSTI,DDC: AD 631 366

As a continuation of 2 previous studies in photochemistry of 2-dialkylamino-phenoxaz-3-ones has been investigated. In general these compounds have been found to be more photo-reactive than the corresponding monoalkylamino-phenoxaz-3-ones. The-dimethylaminophenoxaz-3-one 4 underwent photochemical demethylation. Irradiation of the 2-polymethylenemiminophenoxaz-3-ones gave different products depending upon the size of the polymethylenemimine ring. The phenoxazones 9, 11, and 12 gave novel pentacyclic compounds 23, 25, and 26 respectively. Stable dihydrophenoxaz-3-ones have been obtained by the reduction of compounds 10, 11, and 12. (Author abstract)##

01210

J. N. Pitts, Jr., J. K. S. Wan, and E. A. Schuck

PHOTOCHEMICAL STUDIES IN AN ALKALI HALIDE MATRIX. I. An o-nitrobenzaldehyde Actinometer and Its Application to a

Kinetic Study of the Photoreduction of Benzophenone by Benzhydrol in a Pressed Potassium Bromide Disk. J. Am. Chem. Soc. 86, 1808-10, Sept. 20, 1964.

The feasibility of quantitative photochemical studies in a solid KBr "pellet" of the type customarily used for IR studies was investigated. Irradiation was by filtered UV light at an angle to the "analyzing" IR beam from the IR spectrophotometer. An actinometer consisting of o-nitrobenzaldehyde dispersed in the KBr disk was developed to measure light intensities and was used to obtain room temperature quantum yields in the system benzophenone-benzhydrol similarly dispersed in KBr. IR spectroscopy was used to identify products and determine reaction rates by repetitive scanning in situ. In the photoreduction of benzophenone by benzhydrol at 3130 A., the value of phi for benzophenone disappearance was a function of benzhydrol concentration and approached unity at high concentrations. Benzhydrol disappeared by an apparent first-order law. Assuming a simple mechanism, the ratio of the rate constants for the deactivation vs. the reduction of excited benzophenone to form ketyl radicals was 0.015 mole/l. of KBr. Addition of naphthalene to the "pellet" reduced the phi of benzophenone disappearance. The ratio of the rate constants kq/kh for naphthalene "quenching" vs. reduction of benzophenone by benzhydrol was estimated at about 50. These experimental findings indicate that photoreduction in the KBr matrix proceeds via triplet benzophenone, as in liquid solutions. "Blending" benzophenone and benzhydrol with KBr and forming disks at a pressure of 4000 p.s.i. by the usual pelletizing technique seems to result in a uniformly dispersed "solid solution." (Author abstract modified)##

01233

P. Ausloos and R. E. Rebbert

PHOTOELIMINATION OF ETHYLENE FROM 2-PENTANONE. J. Am. Chem. Soc. 86, pp. 4512, 1964.

Author reports additional information concerning photoelimination of olefins from carbonyl-containing compounds. Measurements of the light emission were observed in the energy transfer process in the photolysis of 2-pentanone. Authors conclude the probability that at any given wavelength the same process will occur from either a triplet or a single state may depend on the structure of the compound under consideration.##

01241

M. A. Accomazzo and R. Hobe

CATALYTIC COMBUSTION OF C1 TO C3 HYDROCARBONS. Ind. Eng. Chem. Prod. Res. Develop. 4, (5) 425-30, Oct. 1965. (Presented at the 149th Meeting American Chemical Society, Division of Petroleum Chemistry, Detroit, Mich., Apr. 1965.)

The catalytic combustion kinetics of methane, ethane, ethylene, acetylene, propane, propylene, propadiene, propyne, and cyclopropane on CuO:Al2O3 has been investigated at initial hydrocarbon concentrations between 102 and 1450 ppm in the temperature range 140 to 510 C., and at gas flow rates of 160, 275, and 525 liters per hour STP. The correlation considered temperature gradients along the bed and external diffusion of reactant to the catalyst surface. The predicted results agreed within 15% of the experimental results at the higher flow rates between 10 and 80% conversion. Methane was the most difficult hydrocarbon to oxidize and acetylene was the easiest. In general, increase in carbon number decreased the temperature necessary for a given conversion. For a given carbon number, the required temperature decreased with degree of saturation. The combustion products were essentially only carbon dioxide and water. The same catalyst bed was used for approximately 1000 hours with no loss in activity. (Author abstract)##

01310

H.J.S. Stevenson, D.E. Sanderson, A.P. Altshuller

FORMATION OF PHOTOCHEMICAL AEROSOLS. Intern. J. Air Water Pollution, Vol. 9:187-95, June 1965. (Presented at the American Industrial Association Conference, Philadelphia, Pa. April 29, 1964.)

Aerosol was produced photochemically by irradiation of a number of hydrocarbon-nitrogen dioxide mixtures, some requiring sulfur dioxide. In those reactions not requiring sulfur dioxide, its addition increased the aerosol production in most cases. Mixtures of hydrocarbons gave more aerosol than expected from their production individually. Shorter wavelength illumination had little effect indicating that sulfur dioxide activation is unimportant. The size of the aerosol depended upon the conditions of the experiment. (Author abstract)##

01358

B.D. Tebbens F. Ottoboni

DYNAMICS OF VAPOR-AIR MIXTURES. Am. Ind. Hyg. Assoc. J., Vol. 26:565-568, Oct. 1965.

Although it is generally recognized that density difference affects the vertical movements of gases, the downward flow of heavier-than-air mixtures has received little experimental attention. On theoretical grounds, a very small density increase can produce downward flow. Experimentally, a density difference of 0.5% was sufficient to induce vertical gas flow in a pipe. From a series of observations it was found that the relationship of density to flow rate can be characterized, and that in unrestricted systems the maximum concentration of heavy vapor is far less than that predicted from vapor pressure data. This maximum is related not only to vapor pressure, evaporation rate, temperature, etc., but also to the fact of downflow and air induction associated with it. (Author abstract)##

01579

F.C. Alley I.A. Hipperton

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL OXIDANT PRODUCTION IN A BENCH SCALE REACTION SYSTEM. J. Air Pollution Control Assoc., Vol. 11:581-584, Dec. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The tabulated results of nine irradiation runs are given for olefin and nitrogen dioxide mixtures. The oxidant production is shown as a function of time of irradiation and temperature. Oxidant production was calculated by subtracting the initial oxidant reading before the lights were turned on from the oxidant reading at the particular sample interval. The peak oxidant production was approximately doubled for each 10 degree temperature increase. The average hydrocarbon reaction rate for each four-hour irradiation period is plotted against temperature. The rate increased sharply as the reaction temperature increased from 13.5 to 25 C, then decreased slightly AS THE TEMPERATURE INCREASED TO 35.0 C. FROM THESE RESULTS IT is concluded that the peak oxidant production occurring during the irradiation of olefin and nitrogen dioxide mixtures is dependent on the reaction temperature. The magnitude of this temperature effect is of the same order as that which would be predicted for a thermal reaction.##

01628

F. A. Vingiello and T. J. Delia

CLEAVAGE OF 10-SUBSTITUTED 1,2-BENZANTHRACENES. J. Org. Chem. 26, 1005-8, Apr. 1961. (Presented before the Chemistry Section at the Southeastern Regional Meeting, American Chemical Society, Birmingham, Ala., Nov. 1960.)

Authors present information concerning the acid-catalyzed decyclization of an aromatic hydrocarbon. In order to gain information regarding the cleavage, a group of ketones was synthesized, the study of whose cyclization might give information regarding two factors thought to be important in the cleavage; namely, stability of the carbanium ion of the departing group and steric requirement of the departing group. Data in the report indicates that both alkyl and aryl groups may be lost from aromatic polynuclear compounds as a result of an acid-catalyzed reaction and that the stability of carbonium ion of the departing group as well as steric strain may facilitate the cleavage.##

016510

F. A. Vingiello, S. G. Guo, and P. Poiss

7- AND 12-THIENYLBENZ(A)ANTHRACENES. J. Org. Chem. 30, 266-9, Jan. 1965.

Authors describe the preparation properties and mode of formation of 7- and 12-thienylbenz(a)anthracenes. Analysis of the spectral patterns were made.##

016511

F. A. Vingiello and W. W. Zajac

SOME NEW ALKYL 1,2,3,4-DIBENZOPYRENES. J. Org. Chem. 26, 4228-30, July 1961. (Presented before the Division of Organic Chemistry at the Southeastern Regional Meeting, American Chemical Society, Birmingham, Ala., Nov. 1960.)

Using a previously described method, the authors prepared and catalytically cyclodehydrogenated 9- mono- and dimethylphenyl-1,2 benzanthracenes to give a series of new alkyl-substituted 1,2,3,4 - dibenzopyrenes.##

016512

F. A. Vingiello and R. H. Schlechter

SYNTHESIS AND CYCLIZATION OF THE THREE ISOMERIC 2-BENZYLPHENYL PYRIDYL KETONES. J. Org. Chem. 24, 2049-50, Sept. 1959. (Presented before the Division of Organic Chemistry, Southeastern Regional Meeting, American Chemical Society, Richmond, Va., Nov. 1959.)

A considerable number of studies have been made regarding the rates of the acid-catalyzed aromatic cyclodehydration of ketones; these studies included only ketones containing one basic group, the carbonyl function of the ketone. Substituents on the ketone were restricted to alkyl groups and halogen atoms. The cyclization behavior of ketones containing a group more strongly proton accepting than the ketonic carbonyl would test a possible limitation of the Bradsher-type aromatic cyclodehydration reaction. Protonation of the substituent might retard formation of the carbonium ion needed for cyclization. This inference actually does not exist since all three isomeric 2-benzylphenyl pyridyl ketones are cyclized at a faster rate than 2-benzylbenzophenone by the usual hydrobromic acid-acetic acid-water mixture.##

01631

F. A. Vingiello, W. W. Bajac, Jr., and L. G. Mahone

THE SYNTHESIS OF NAPHTHO(2,1-A)PERYLENE AND DIBENZO(AE)PERYLENE. J. ORG. CHEM. 28, 3253-5, NOV. 1963. (Presented before the Division of Organic Chemistry, Combined Southeastern-Southwestern Regional Meeting, American Chemical Society, New Orleans, La., Dec. 1961.)

A method for synthesis of naphtho(2,1-a)perylene and dibenzo(ae)perylene is described .* Various dehydrogenation agents and reaction procedures were used in an attempt to convert 8-(1-naphthyl) benz(a)anthracene to naphtho(2,1-a)perylene; heating with sulfur, with selenium, with palladium on carbon; vapor phase dehydrogenation at 430 C on asbestos; fusion with sodium and aluminum chloride; pyrolysis of 700 C; aluminum chloride in boiling benzene; and aluminum bromide in boiling benzene - all failed to give a significant yield. Finally, cyclodehydrogenation of 8-(1-naphthyl)benz(a)anthracene with stannic chloride and aluminum chloride in boiling benzene for five minutes gave a sufficient yield.**

01634

F. A. Vingiello, F. B. Hilerbe, T. J. Delia, and J. Vanes

SYNTHESIS OF THE THREE ISOMERIC 7-PYRIDYLBENZ(A)ANTHRACENES. J. Med. Chem. 7, pp. 121, 1964.

The authors, aware of the causal relationship between certain polynuclear compounds related to benz(a)anthracene and their carcinogenic effect, prepared the three isomeric 7-pyridylbenz(a)anthracenes for screening for possible carcinogenic activity. The synthetic route to these compounds involves extensions to useful cyclodehydrogenation reactions, previously recorded.**

01635

F. A. Vingiello and T. J. Delia

12-PYRIDYLBENZ(A)ANTHRACENES. J. Org. Chem. 29, 2180-3, Aug. 1964. (Presented in part before a joint meeting of the Division of Water and Waste Chemistry and the Division of Analytical Chemistry, 130th National Meeting, American Chemical Society, Chicago, Ill., Sept. 1961.)

The authors extended the dehydrogenation reaction to the 12-pyridylbenz(a)anthracenes and consequently have

azadibenzopyrenes for testing of carcinogenicity. In accomplishing this reaction five new ketones and one ketimine (amine) have been prepared and ring closed to their corresponding 12-pyridylbenz(a)anthracenes which were then studied in dehydrogenation reactions.##

01688

W. E. Morganroth and J. G. Calvert

THE PHOTOLYSIS OF 1,1'-AZO-N-BUTANE VAPOR; THE REACTIONS OF THE N-BUTYL. Preprint. (Presented before the Division of Physical Chemistry, 149th National Meeting, American Chemical Society, Detroit, Mich., Sept. 1964.)

The vapor phase photolysis of 1,1'-azo-n-butane, at 3660 A was investigated as a function of reactant pressure, temperature, light intensity, and added gas. The sequence of listed reactions is consistent with observed results. With the assumption that the rate constant for the reaction, 2n-C4H9 yields n-C4H10 is 2.2 x 10 to the 13th power cc/mole-sec, and that for the reaction, (n-C4H9) 2N2 + M yields (n-C4H9)2N2 + M' is 3.2 x 10 to the 19th power cc/mole-sec, the rate constants for the following reactions were estimated: (n-C4H9)2N2 yields 2n-C4H9 plus N2, k2 approx equals 2.5 x 10 to the 9th power x e to the -3.0/RT power/sec; n-C4H9 yields C2H plus C2H5, k5 approx equals 1.7 x 10 to the 13th power x e to the -28.7/RT power/sec; n-C4H9 plus (n-C4H9) 2N2 yields n-C4H10 plus C4H8N2C4H9, k6 approx equals 1.8 x 10 to the 11th power x e to the -7.1/RT power cc/mole-sec. The disproportionation to the combination ratio for the n-C4H9 radical (k3/k4) is estimated as 0.14. Estimations of the thermodynamic quantities for the n-C4H9 radical are given.##

01677

S.W. Benson G. Haugen

THE ELIMINATION OF HF FROM "HOT" FLUORINATED ETHANES. AN ESTIMATION OF THE ACTIVATION ENERGIES AND RATE PARAMETERS. J. Phys. Chem. 69, (11) 3898-3905, Nov. 1965

BASIC SCIENCE-TECHNOLOGY: Fluorinated hydrocarbons, Decomposition, Fluorides, Activation energy, Reaction kinetics, Thermodynamics

The classical Rice-Ramsperger-Kassel theory of unimolecular reactions is shown to give a quantitative description of the decomposition of a "hot" molecule of CH2FCH2F. The analysis also makes possible an estimate of the activation energy for the elimination of HF from this molecule within narrow limits: CH2FCH2F yields CH2 equal CFH plus HF; Eact equal 69 plus or minus 3 kcal./mole; delta H298, equal 8 kcal./

mole. From the theory one predicts the observed reductions in the rate of the elimination reactions for the series of "hot" molecules $C_2H_{6-x}F_x$ as x is increased. A similar analysis gives a theoretical explanation of the observed pressure dependence of the rates of stabilization of the "hot" molecules (CH_2Cl. CH_2Cl), ($CH_2Cl.CHCl_2$), and ($CHCl_2.CHCl_2$). A quantum modification of the classical Rice-Ramsperger-Kassel theory was found necessary when the magnitude of the unfixed internal energy approaches the size of a quantum of vibrational energy. This approximation of the classical theory predicted the correct rate of elimination of a Cl atom from the hot radical ($CHCl_2CHCl_2$) which at the transition state had only 3 kcal./mole of unfixed energy. In these calculations the carbon-carbon bond energy in ethane was assumed to be invariant upon the replacement of hydrogen by halogen atoms. (Author abstract) 28

01680

R.W. Egger S.W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. VII. THE STABILIZATION ENERGY IN THE PENTADIENYL RADICAL AND THE KINETICS OF THE POSITIONAL ISOMERIZATION OF 1,4-PENTADIENE. J. Am. Chem. Soc. 88 (2) 241-6, Jan 20, 1966.

The kinetics of the iodine atom catalyzed isomerization of 1,4-pentadiene to form 1,3-pentadiene has been studied in the gas phase over a temperature range from 139 to 241. The formation of small amounts of n-pentenes and cyclopentene does not change the basically very simple rate law for the positional isomerization of n-pentadienes which is governed by the rate of abstraction of a hydrogen atom from 1,4-pentadiene by iodine. When compared with the activation energy for the analogous hydrogen abstraction from n-pentane, assuming the activation energies for the back reactions to be equal (HI attack on pentyl and pentadienyl radicals), one obtains 15.6 plus or minus 1 kcal./mole for the resonance energy in the pentadienyl radical. This value is only 25% larger than the allyl stabilization energy. These stabilization energies are discussed in terms of a simple model of three-electron bonds and related to energies in the benzene system. (Author abstract modified) 28

01682

D.M. Golden, R. Walsh, S.W. Benson

THE THERMOCHEMISTRY OF THE GAS PHASE EQUILIBRIUM I2 PLUS CH4 (REVERSIBLE) CH3I PLUS HI AND THE HEAT OF FORMATION OF THE METHYL RADICAL. J. Am. Chem. Soc. 87, (19) 4053-7, Sept. 20, 1965.

With the aid of a Cary spectrophotometer, modified for use with high-temperature gas systems, it has been possible to obtain the equilibrium constant for the reaction CH_4 plus I_2 yields

(reversible) CH3I plus HI at 595, 630, and 667 K. From the measured value at 630 K. of Keq= 2.32 plus or minus 0.09 plus 10 to the -4 power and the known values, delta S630 = 3.64 gibbs/mole and delta Cp= plus 0.63 gibbs/mole, the heat of reaction at 298 K. is found to be delta H298 = 12.55 plus or minus 0.13 kcal./mole. Combining this with known values of the heats of formation of CH4, I2, and HI yields the value delta Hf 298 (CH3I(g))= 2.38 plus or minus 0.016 kcal./mole. These results together with the kinetic parameters of Flowers and Benson lead to delta Hf 298 (CH3(g)) = 34.1 plus or minus 0.5 kcal./mole, DH298(CH3-H) = 104.1 plus or minus 0.5 kcal./mole, DH298(CH3-I) 56.3 plus or minus 0.5 kcal./mole is good agreement with recent data on these quantities. (Author abstract)##

01747

J.C.W. Chien

THE PHOTOOXIDATION OF HYDROCARBONS. Hercules Chem. (53) 19-23, Sept. 1965.

After a brief discussion of photooxidation theory, photoinitiated oxidation in the presence and absence of light absorbers is described. The effect of impurities on photooxidation of hydrocarbons is discussed. The theory of charge-transfer absorption by hydrocarbon-oxygen systems is examined. Other charge-transfer initiated reactions are mentioned. It is concluded that charge-transfer is of little significance in the photooxidation of polyolefins. Governing factors for degradation of these resins are impurities and additives. Charge-transfer, however, may be responsible for photooxidation of hydrocarbons and pollution in the atmosphere. The author believes that the hypothesis of photoinitiation by charge-transfer will lead to an extension of knowledge of reactions occurring in the atmosphere.##

01771

R. D. Cadle and E. R. Allen

KINETICS OF THE REACTION OF O(3P) WITH METHANE IN OXYGEN, NITROGEN, AND ARGON-OXYGEN MIXTURES. J. Phys. Chem. 69, (5) 1611-5, May 1965.

Rate constants for the reaction of atomic oxygen with methane have been determined using molecular oxygen, molecular nitrogen, and argon-oxygen mixtures as the carrier gas. The reactions were first order with respect to each reactant. Rate constants were much higher for oxygen than for nitrogen as the carrier gas and were represented by the expressions k equal 2.1 (plus or minus 1.5) times 10 to the 13 power exp(-5500 (plus or minus 1500/RT)cu cm/mole sec.) and k equal 7.7 (plus or minus 1.5) times 10 to the

12 power exp(-7100 (plus or minus 1500/RT) cu cm/mole sec.) respectively. Apparently, ground-state molecular oxygen, when present in appreciable quantities, took part in the reaction. (Author abstract)##

01828

R.E. Rebbert P. Ausloos

QUENCHING OF THE TRIPLET STATE OF ACETONE AND DIACETYL BY VARIOUS UNSATURATED HYDROCARBONS. J. Am. Chem. Soc. 87, (24) 5569-72, Dec. 20, 1965.

The quenching effect of several unsaturated hydrocarbons on the emission from acetone, excited at 3130 A., has been determined in the gas phase at 32 degrees. It is noted that addition of an olefin usually results in a pronounced reduction of the phosphorescence emitted by acetone but that the fluorescence yield remains unchanged. It is suggested that acetone transfers its triplet energy to the olefin molecule. It is concluded that when the energy-transfer process is endothermic, the quenching efficiency increases with diminishing delta H of the reaction. When the energy-transfer process is exothermic, no correlation is seen between the quenching efficiency and the delta H of the reaction. Because of the low energy of the 0-0 band, corresponding to the S sub 0 - T sub 1 transition in biacetyl, triplet-state energy transfer from biacetyl to most monoolefins occurs with very low efficiency. The probability that triplet energy will be transferred upon collision is as follows: 1,3-butadiene, 1.6 x 10 to the minus 4 power; styrene, 2.5 x 10 to the minus 5 power; 2,3-dimethyl-2-butene, 1.6 x 10 to the minus 7 power. (Author abstract)##

01911

P. Ausloos and S. G. Lias

H2-TRANSFER REACTIONS IN THE GAS-PHASE RADIOLYSIS OF HYDROCARBONS. J. Chem. Phys. 43, (1) 127-35, July 1, 1965.

The radiolysis of cyclohexane has been investigated in the presence of varying concentrations of acetylene, ethylene, propylene, butene, and cyclopropane. On the basis of a number of observations, it is concluded that, in all cases, the H2-transfer reaction C sub n H sub x plus cyclo-C6H12 plus yields C sub n - H sub x plus 2 does take place. No extensive rearrangement occurs in the collision complex. For instance, a transfer of H2 to CD2CHCD2 results exclusively in the formation of CD2CDHCD2H, while an H2 transfer to (CD2)3 leads to the formation of CD2HCD2CD2H. Relative rate constants for the transfer of an H2 molecule to CH2CHCH2, 1-C4H8, iso-C4H8, 2-C4H8, C2H2 are, respectively, 1.00, 0.68, 0.27, 0.10, 0.11, and 0.072. Similar variations in the relative rate constants of the H2-transfer reaction C sub n H sub x (plus) cyclo-C6H12

yields C sub n H sub m plus 2 plus C6H10 plus are noted. The following additional information was derived in the course of the study: (1) When cyclopentane or n-pentane is substituted for cyclohexane in the reaction mixture, the H2-transfer reaction again occurs. Under comparable experimental conditions, the probability of the H2-transfer reaction is proportional to the yield of the parent ion as derived from the 70-eV mass-spectral cracking patterns. (2) An increase in the pressure of cyclopentane, from 12.7 to 210 mm, leads to approximately a 50% increase in the yield of the parent ion of cyclopentane. (3) The parent cyclohexane ion undergoes a charge transfer to NO at a rate which is comparable to the rates of the H2-transfer reactions. O2 does not interact with the parent ion. (4) The cyclopropane-d sub 6 parent ion reacts with cyclo-C6H12 to form C9D5HC02H, indicating that this ion acquires the propylene ion structure prior to or during reaction. (Author abstract)##

01875

R. F. Bruneile, J. E. Dickinson, and W. J. Hanning

EFFECTIVENESS OF ORGANIC SOLVENTS IN PHOTOCHEMICAL SMOG FORMATION (SOLVENT PROJECT, FINAL REPT.). Air Pollution Control District, Los Angeles County, Calif., Evaluation and Planning Div. July 1966. 188 pp.

The principal objective of this study, the determination in an environmental chamber of the smog-forming potentials of individual organic solvents likely to be emitted to the atmosphere, was accomplished and it is now possible to reach certain conclusions based on these data. By compound types, the effects to which each solvent group was found to contribute can be summarized as follows: (1) Aromatic hydrocarbons, except benzene, contribute substantially to aerosol formation, rapid O3 formation, eye irritation and total aldehyde formation. (2) Chlorinated hydrocarbons exhibit almost greater O3 forming activity than the aromatics. Eye irritation was moderate to severe, depending upon the test conditions, and aerosol formation was negligible. On the basis of an experiment with tetrachloroethylene (8 ppm) and NO (2 ppm), alone, it is concluded that most of the activity of the mixed chlorinated solvent may be attributed to trichloroethylene. (3) Aliphatic hydrocarbons (alkanes), both high-boiling and low-boiling, contribute primarily to O3 formation. They also produce total aldehyde concentrations comparable with those produced by irradiation of auto exhaust. The high-boiling alkanes tested tend to exhibit greater reactivity than the low-boiling materials. (4) Ketones contribute significantly to O3 formation (0.3 - 0.8 ppm after 5 to 6 hours' irradiation) and, to some extent to eye irritation, though mostly at higher concentrations or with mixtures. As with several other solvents, aerosol formation is negligible. A single test with acetone (8 ppm) and NO (2ppm) showed little activity by this compound with respect to ozone formation or aerosol formation, and only very slight eye irritation was indicated. Data indicate that the branched ketones are considerably more reactive than straight-chain ketones. (5) Alcohols are the least active class of compounds tested.##

01880

K. W. Egger and S. W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. V. Kinetics of the Geometrical Isomerization of 1,3-Pentadiene, a Check on the Rate of Rotation about Single Bonds, and the Allylic Resonance Energy. J. Am. Chem. Soc. 87, (15) 3314-9, Aug. 5, 1965.

The kinetics of the nitric oxide catalyzed, homogeneous, gas phase isomerization of 1,3-pentadiene have been studied over a temperature range between 126 and 326 degrees. Analysis of the data shows that the rate-controlling step in the NO-catalyzed geometrical isomerization of pentadiene is the rotation about the single bond in the intermediate radical. Iodine is shown to form a much more stable intermediate radical, and results indicate that, in the I2-catalyzed system, the addition reaction of I atoms is rate controlling. The rotational rate constant log kr was calculated to be (11.5 plus or minus 0.3) - (5.3 plus or minus 1.0)/theta sec. compared to (11.2 - (3.6)/theta sec.) as reported earlier for the iodine catalyzed cis-trans isomerization of 2-butene. (Author abstract modified)##

01881

K. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. IV. Thermodynamic Data from Equilibrium Studies of the Geometrical Isomerization of 1,3-Pentadiene. J. Am. Chem. Soc. 87, (15) 3311-4, Aug. 5, 1965.

The measurement of equilibrium constants of the iodine-catalyzed gas phase reactions of olefins and their parent hydrocarbons has been shown to be a very simple, direct, and valuable method to determine precise differences in the thermodynamic properties of the reactants. Applied to the cis-trans isomerization of 1,3-pentadiene, the present paper reports an appreciable amount of side reactions and considerable difficulties in product separation. This result is in contrast to the clean-cut experiments on the isomerization of 2-butene. The important two side reactions, the polymerization of 1,3-pentadiene and the formation of diiodide in the lower temperature range, are shown to be a consequence of the considerably more stable radical intermediate formed with 1,3-pentadiene compared to 2-butene. The NO-catalyzed system showed excellent reproducibility and no measurable side reactions. NO2 gave rise to the same difficulties obtained with the iodine catalysis. This is to be expected from the C-ONO bond strength of about 50 kcal.##

01891

O. R. Youngquist and J. L. Allen

KINETICS OF THE ADSORPTION OF PURE HYDROCARBONS BY SYNTHETIC ZEOLITES. Preprint. 1961.

Rate and equilibrium data for adsorption of ethane, ethylene, propane, propylene, butane and butylene on a synthetic zeolite, Davison Calcium Microtraps, were obtained. Intraparticle diffusion was found to be rate limiting. Effective diffusion coefficients and their concentration and temperature dependence were determined. Equilibrium data were successfully correlated using the Potential Theory. (Author summary)##

01961

G. B. McMillan, J. G. Calvert, and J. N. Pitts, Jr.

DETECTION AND LIFETIME OF ENOL-ACETONE IN THE PHOTOLYSIS OF 2-PENTANONE VAPOR. J. Am. Chem. Soc. 86, 3602-5, Sept. 20, 1964.

The formation of the enol form of acetone in the "type II" primary photochemical process in methyl ketones containing gamma-hydrogen atoms has received general acceptance in recent years on the basis of published indirect evidence. In this work a direct observation of the transient enol form of acetone has been made by infrared absorption during the photolysis of 2-pentanone. The enol to keto conversion was studied by following both the disappearance of the enol and the appearance of the keto form using long-path infrared techniques. The half-life of enol-acetone is about 3.1 min. at 27 degrees and 750-mm. total pressure. The ketonization process seems to occur mainly at the reaction vessel wall. Photolyses of 2-pentanone were also carried out in small reaction vessels pretreated with D2O. In this case the keto-acetone ultimately produced is partly monodeuterated, and a partial exchange of the enol form at the vessel wall is indicated; this result is similar to that reported by Srinivasan in experiments with 2-hexanone. The extent of exchange exhibits a peculiar dependence on the residence time in the cell which complicates the interpretation of the ketonization step under these conditions. (Author abstract)##

01978

A. P. Altshuller, I. R. Cohen, S. F. Sleva, and S. L. Kopczynski

AIR POLLUTION: PHOTOOXIDATION OF AROMATIC HYDROCARBONS. Science 138, (3538) 442-3, Oct. 19, 1962.

A number of aromatic hydrocarbons participate as effectively as the olefins in atmospheric photooxidation reactions in the presence of nitrogen oxides and ultraviolet light. Judged both on the basis of reactivity and concentrations in the atmosphere, the aromatic hydrocarbons cannot be ignored as contributors to the photochemical type of air pollution. (Author abstract)##

01990

A. Goetz and T. Kallai

THE SYNTHESIS OF DEFINED AEROSOL SYSTEMS. Am. Ind. Hyg. Assoc. J. 24, 453-61, Oct. 1963.

instrumentation and procedures for the synthetic production of photochemical aerosols within a laminar airflow along a tubular channel are described. Special micro-dosimetry quantitatively facilitates continuous addition of reactive trace components (hydrocarbons, NO, NO2, SO2) and of defined nucleating particulates. The flow is subsequently irradiated symmetrically in the spectral range (320-450 millimicrons) in a special channel section without temperature increase, at adjustable intensity levels and exposure durations up to several times solar intensity at ground level. The resulting aerocolloidal components are analyzed with the Aerosol Spectrometer for determining the size and mass distribution of the photoactivated particulates at various reaction stages. Examples of smog-type reactions between traces of NO2 and olefins, and of modifications of natural aerosols, are presented. (Author abstract)##

02082

E. Saltzman, T.W. Stanley, J. Pfaff, H. Johnson

SENSITIVE NEW METHODS FOR AUTOCATALYTIC SPECTROPHOTOMETRIC DETERMINATION OF NITRITE THROUGH FREE-RADICAL CHROMOGENS. Anal. Chem. 35, (13) 2181-91, Dec. 1963.

Many of the methods presented here are more sensitive than any described in the literature. A molar absorptivity of 1,270,000 can be obtained in the 1-methyl-2-quinolone azine procedure, while in most other procedures molar absorptivities average over 200,000. The following reagents are compared: 1-methyl-2-quinolone azine, 3-methyl-2-benzothiazolinone azine, glyoxal bis (N,N diphenylhydrazone), 3-methyl-2-benzothiazolinone picrylhydrazone, phenothiazine, N,N,N',N'-tetramethyl-4,4'-diaminostilbene, N,N' - diphenyl p - phenylenediamine, N,N,N',N-tetramethylbenzidine, N,N,N',N'-tetramethyl - p - phenylenediamine, and N,N,N' - trimethyl - p - phenylenediamine. The syntheses of some of the reagents are given. Evidence is presented that free radicals are obtained in all the procedures. The advantages and disadvantages of the methods are discussed. Recommendations are given for application of some of the procedures to the analysis of solutions containing dyes, large amounts of sulfite, or minute amounts of nitrite. (Author abstract)##

02160

C. A. Clemons, P. W. Lesch, and A. P. Altshuller.

1,2,3,-TRIS (2-CYANOETHOXY) PROPANE AS A STATIONARY PHASE IN THE GAS CHROMATOGRAPHIC ANALYSIS OF AROMATIC HYDROCARBONS. ANAL. CHEM. 35, (10) 1547-8, SEPT. 1963

The gas chromatographic procedure described has been used successfully to follow the rate of disappearance of various aromatic hydrocarbons in diluted auto exhaust in a large photochemical reactor. Some of the concentrations of the aromatic HYDROCARBONS ARE AS FOLLOWS BENZENE, 0.07 P.P.M.; TOLUENE, 0.15 p.p.m.; ethylbenzene, 0.04 p.p.m.; and n-propylbenzene, 0.01

p.p.m. Excellent analytical results have been obtained even at low concentration levels. For example, in one series of seven experiments in which the initial concentration of m-xylene plus p-xylene was only 0.030 p.p.m., it was determined that 0.014 plus or minus 0.001 p.p.m. were photooxidized to products. Such results are possible only if column substrates such as 1,2,3-tris (cyanoethoxy)-propane, which have good selectivity and excellent stability, are available to use with flame ionization detectors operating at maximum sensitivities.##

02203

B.D. Tebbens, J.P. Thomas, M. Mukai

FATE OF ARENES INCORPORATED WITH AIRBORNE SOOT. Am. Ind. Hyg. Assoc. J. 27, (5) 415-22, Oct. 1966.

Modification of airborne arenes by environmental factors is significant not only because of possible reduction or enhancement of biologic effect on humans in contact with air contaminants, but also of the difficulty in relating arene sources to the compounds found in air. Smoke as an experimental source of arenes was diluted, then irradiated in a 22-ft. dynamic flow chamber. Samples were collected before and after irradiation and determination of concentration of 2 arenes, benzo(a)pyrene and perylene, and particle sizes were made. Irradiation caused partial modification or disappearance of the arenes by 35-65% of the original content. Without irradiation an apparent increase of arenes was noted and this was thought to be a function of the system and particle size factors. The presence of oxygen increases the degree but is not necessary for the modification of arenes. (Author abstract modified)##

02204

R.R. Teeter, C.F. Spencer, J.M. Green, L.H. Smithson

ANALYSIS OF ALPHA OLEFINS USING A GAS CHROMATOGRAPH-MASS SPECTROMETER COMBINATION. J. Am. Oil Chemists' Soc. 43, 82-6, Feb. 1966. (Presented at the American Oil Chemists' Society Meeting, Houston, Tex., Apr. 1965.)

The gas chromatograph-mass spectrometer (GCMS) combination with and without catalytic hydrogenation is the most effective way to obtain detailed analysis of commercial alpha olefin mixtures. Previous descriptions of this technique presented examples only up to C10 alpha olefins. We have extended this technique to include alpha olefins up to C20. The complete analysis of C11-C19 alpha olefin mixture is given as an example. (Author abstract)##

02243

R.E. Rebbert P. Ausloos

THE REACTIONS OF METHYL RADICALS IN THE SOLID-, LIQUID-, AND GAS- PHASE PHOTOLYSIS OF DIMETHYLMERCURY. J. Am. Chem. Soc. 85, 3086-9, Oct. 20, 1963.

The gas-phase photolysis of CD3COCD3 has been investigated in the presence of CH3HgCH3 from 376 to 451 K. From the isotopic distributions of the methane and ethane fractions, evidence was obtained for the occurrence of the reaction: CD3 plus CH3HgCH3 yielding CD3HgCH3 plus CH3 (Energy of activation equals 12.6 kcal./mole). This reaction is also postulated to occur in the liquid-phase photolysis of dimethylmercury. From the isotopic distribution of the ethane produced in the liquid- and solid- phase photolysis of CH3HgCH3-CD3HgCD3 mixtures, it was concluded that cage recombination of methyl radicals does take place. Contrary to the conclusions reached in an earlier work by Derbyshire and Steacie, no evidence could be obtained for hot methyl radical effects in the liquid-phase photolysis of dimethylmercury. (Author abstract)##

02253

H. C. Hottel, G. C. Williams, N. H. Nerheim, and G. R. Schneider

KINETIC STUDIES IN STIRRED REACTORS; COMBUSTION OF CARBON MONOXIDE AND PROPANE. Symp. Combust., 10th, Cambridge Univ., England, 1964. 1965. pp. 111-21.

The burning rates of carbon monoxide and of propane premixed with oxygen, nitrogen, and water vapor in various proportions were measured over ranges of equivalence ratios and pressures. Burning rates were determined from metered flow rates and analysis of reactor products. The burning rate of carbon monoxide q moles/ml (sec) is expressed mathematically. A kinetic mechanism is proposed which fits the data for CO with rate constants consistent with literature values. It calls for the rate-limiting step: CO plus OH yielding CO2 plus H; equilibrium for the following reactions: OH plus H2 equal H2O plus H; H plus O2 equal OH plus O; O plus H2 equal OH plus H; and a three-body chain terminating step. The mechanism proposed for propane combustion involves in addition the very fast reaction of propane to CO and H2O at the expense of OH, O and H.##

02256

G. A. Oldershaw and R. J. Cvetanovic

PHOTOCHEMICAL ADDITION OF HYDROGEN BROMIDE TO 2-BUTENE IN THE GAS PHASE. J. Chem. Phys. 41, (11) 3539-44, Dec. 1, 1964.

The relative rates of the photochemical addition of hydrogen bromide to 2-butene, and of the simultaneous cis-trans isomerization have been measured in the gas phase at 58 C. Similar but less extensive experiments have been carried out with 1,2-dideuteroethylene. In this case, comparison of the rates with the data in the literature indicates much faster cis-trans isomerization than can be expected from the decomposition of thermalized bromoethyl radicals. Alternative explanations of the fast geometric isomerization are briefly discussed.##

02266

C.P. Fenimore G.W. Jones

THE WATER-CATALYSED OXIDATION OF CARBON MONOXIDE BY OXYGEN AT HIGH TEMPERATURE. J. Phys. Chem. 61, 651-4, May 1957.

By sampling burnt gases from lean flat hydrocarbon flames at one atmosphere pressure, the oxidation rate in the presence of ample water at 1700-2000K is determined to be - 1/(O2) (d1n(CO)/dt) = 1.2 x 10 to the 9th power e to the -24,000/RT/(molec/l)/sec. In burnt gas from CO flames containing very little water, -d1n(CO)/dt is independent of oxygen and roughly proportional to water. The slower rate of comparatively dry CO flames is raised toward the value appropriate to hydrocarbon flames by adding hydrogen to the CO. A partial mechanism is suggested which is consistent with these results. (Author abstract)##

02317

D. Phillips.

PHOTOLYTIC PROCESSES IN PERFLUOROCYCLOBUTANONE VAPOR. J. PHYS. CHEM. 70, (4) 1235-43, APR. 1966.
CPSTI, DDC AD 635437

The photolysis of perfluorocyclobutanone in the vapor phase at 1130, 1140, 3660, and 4047 A has been investigated. Fluorescence and decomposition yields have been determined at the four wavelengths and the effects of pressure and temperature upon these studied. Two modes of decomposition occur at the shortest wavelengths and at high temperatures, one producing carbon monoxide and perfluorocyclopropane, the other producing tetrafluoroethylene. A mechanism is proposed which explains the results, and rate constants for reactions are determined. Results indicate that about 7 kcal/mole excess vibrational energy can be removed from the excited ketone by each collision with an unexcited ketone molecule. (Author abstract)##

02378

H.E. Ghaisas, G.R. Youngquist, J.L. Allen, D.W. Muthe, S. Press

DEVELOPMENT OF A CONTINUOUS COUNTERCURRENT FLUID-SOLID CONTACTOR: II. ADSORPTION. Preprint. (Presented at the Air Pollution Symposium, National American Chemical Society Meeting, Chicago, Ill., Sept. 1968.

A continuous countercurrent contacting device for the separation of gas mixtures by adsorption was developed. The device can be used with molecular sieves to separate water and sulfur dioxide from mixtures with air, and ethylene from mixtures with air and ethane. Characteristic mass transfer coefficients were obtained and correlated diagrams. (Author summary)##

02418

A. Goetz R. Fuenchal

THE EFFECT OF NUCLEATING PARTICULATES ON PHOTOCHEMICAL AEROSOL FORMATION. J. AIR POLLUTION CONTROL ASSOC. 15, (3) 90-5, Mar. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, Berkeley, Calif., Jan. 6-7, 1964.)

The role of nucleating particulates in the formation of photochemical aerosols was studied in a steady, laminar flow of ultrafiltered air containing NO2 and octene-1 in the concentration range of: (30 - 170 ppm), when subjected to intense irradiation under isothermal conditions. The particulates consisted of monodisperse polystyrene latex (d equal 0.36 micron) in concentrations similar to those in the atmosphere; the irradiation intensity varied between: (6 - 40,000 lumen/liter) and the mean exposure duration between 30 - 180 sec. Samples of the flow, prior to and after its photoactivation, were withdrawn either by an Aerosol Spectrometer (AS) or by a Royco Aerosol Photometer. The photometric data include all colloidal components in the airborne state, whereas the counts obtained from the AS-deposits refer only to the nucleated latex particles. The following pattern is evident: The photochemical reaction yields fractional products (less than 1%) which have the tendency to agglomerate (or polymerize) due to their relatively low volatility--independent of the presence or absence of nucleating particulates. The growth process appears principally different from that of fog formation by H2O)-condensation, where, for identical supersaturation, it is inversely proportional to the nuclear concentration. In the absence of nuclei, autonucleation, i.e. self-agglomeration, occurs at a much lesser reaction rate and higher photon demand. The growth rate of the nuclei, when present, depends on the concentration of the oxidation catalyst (NO2). Under identical conditions the mass of nuclear accumulant is directly proportional to the concentration of the reactive hydrocarbon, while the growth rate depends on the light intensity and the exposure duration. The findings indicate that density and nature of particulate matter present in an air mass prior or during photo-activation are, aside from the chemical reactant levels, of major significance in aerosol formation. (Author abstract modified) 99

02491

HYDROCARBON - AIR FUEL CELLS. General Electric Co., Lynn, Mass., Direct Energy Conversion Operation. (Technical Summary Rept. No. 8, July 1-Dec. 31, 1965). 265p., 1965
CFSTI AD 479005

Detailed information is presented on a continuing research and development program to develop a direct hydrocarbon oxidation-air fuel cell technology. Current work included research on electrochemical oxidation processes, electrocatalysts, electrolytes, electrode structures, and fuel cell life testing. Multi-pulse potentiodynamic techniques have been further developed for analyzing hydrocarbon surface processes. Performance of fuel cell systems with hydrogen fluoride and phosphoric acid

electrolytes have been studied for high performance hydrocarbon oxidation. Boron carbide and carbon have been successfully employed as substrates for high surface area platinum and the results and application to Teflon-bonded electrodes are reported. A variety of modified Teflon-bonded developmental electrodes were evaluated. (Author abstract)##

02445

G. W. Griffin

PHOTOCHEMISTRY OF UNSATURATED CARBONYL DERIVATIVES AND RELATED SMALL RING SYSTEMS (FINAL REPT. JULY 1, 1963-DEC. 31, 1965.)
Tulane Univ., New Orleans, La., Dept. of Chemistry
(AROD Rept. No. 4375:11.)28 pp., June 1, 1966
CFSTI AD 635217

The photofragmentation of a variety of small ring hoso- and heterocyclic systems including cyclopropanes, epoxides, aziridines, oxaziranes and episulfides are studied. The photorearrangement of cyclopropanes to olfins and the photoinduced conversion of cyclopropanes to indenes also are examined. The studies are complementary and those parameters which determine the reaction course are defined in each case. For example, it is of interest to determine why certain cyclopropanes fragment to carbenes and others simply rearrange to isomeric olefins. Many of these reactions described have synthetic utility and heretofore inaccessible systems have been synthesized. The photofragmentation of stilbene oxide is illustrative and appears to be the method of choice for preparing phenylcarbenes and thus phenylcyclopropanes and cyclopropenes.##

02467

D. Vanderwerf

A STUDY OF THE TEMPERATURE DEPENDENCE OF THE TOTAL ABSORPTANCE OF CO NEAR 4.7 MICRONS AND 2.3 MICRONS AND CH4 NEAR 3.3 MICRONS. Ohio State Univ., Columbus, Research Foundation (Rept. AFCRL-66-448) (Scientific Rept. No. 5) pp. 83, May 1966.
CFSTI, DDC: AD 642926

The dependence of the total absorptance of the bands of carbon monoxide near 4.7 microns and 2.3 microns, and of methane near 3.3 microns, on absorber concentration, pressure, and temperature was measured. Data were taken for absorber pressures between 100 and 1000 mm Hg, and at temperatures up to 600 C, for a fixed absorber path length of 10.6 cm. The nature and possible reasons for the observed temperature dependence of the total absorptance are discussed. (Author abstract)##

02472

S.S. Wilks

PRELIMINARY STUDIES ON LIGHT-INDUCED CARBON MONOXIDE IN CLOSED ENVIRONMENTS. School of Aerospace Medicine, Brooks AFB, Tex., Aerospace Medical Division. Sept. 1963. 9 pp.
CFSTI, DDC AD 420946

Experimental data is presented concerning the effects of solar light upon certain classes of organic substances which may be components of the sealed environment of space vehicles. Many materials such as organic plastics, pigments, insulating material, etc., will, when exposed to light in the presence of oxygen, liberate a number of toxic end products such as carbon monoxide, aldehydes, acids and certain hydrocarbons. In a sealed environment these agents may reach levels toxic to human beings during a long sojourn in a sealed system. Therefore, along with products that may result from thermal and electrical activity (motors, generators, etc.), these products may constitute a considerable hazard in sealed environments. (Author abstract)##

02489

J. K. S. Wan and J. N. Pitts, Jr.

A SPECTROSCOPIC INVESTIGATION OF THE REACTION BETWEEN IODINE AND CYCLOPROPYLAMINE. Tetrahedron Letters, 44:3345-50, 1964

The reaction between iodine and cyclopropylamine in n-heptane solution was studied spectroscopically. Preliminary results suggest that 1:1 charge-transfer complex between iodine and cyclopropylamine was formed first; subsequently precipitation of white crystals of a 2:1 cyclopropylamine-iodine complex, $(C_3H_5NH_2)_2 \cdot I_2$ (A), occurred. Evidence suggests that the solid product (A) has probably an ionic structure.##

02493

J. K. S. Wan, L. D. Hess, and J. N. Pitts, Jr.

FREE-RADICAL ADDITION TO AZOBENZENE IN CUMENE SOLUTION. ELECTRON PARAMAGNETIC RESONANCE SPECTRA OF SOME LONG-LIVED RADICAL INTERMEDIATES. J. Am. Chem. Soc. 86, 2069-70, 1964

A degassed solution of azobenzene in cumene was irradiated at room temperature in the microwave cavity of Varian V 4500 e.p.r. spectrometer with 100-kc. field modulation. Light source was a PEK mercury high pressure lamp equipped with filters which absorbed wave lengths shorter than 4000A. At room temperature irradiation, a spectrum was observed with an intensity dependent upon the initial concentration of azobenzene. The spectrum is a triplet, each component of which contains 6 groups of lines with intensities following a 1:3:3:1 binomial distribution. Each of the groups is further split into 3 lines. The radical structure consistent with observed spectrum is composed of the azobenzene and

cusene structures joined at a nitrogen atom and the tert-carbon atom. Experimental coupling constants and experimental and theoretical spin densities are tabulated. Separate experiments on a larger scale in which the reaction was subjected to liquid chromatography resulted in N,N'-Dephenyl-N-(1-methyl-1-phenylethyl) hydrazine being eluted. Its identity was confirmed by IR and n.m.r. analysis.**

02495

R. Rukal, B. D. Tebbens, and J. F. Thomas.

MULTIDIMENSIONAL CHROMATOGRAPHY OF ARENES PRODUCED DURING COMBUSTION. Anal. Chem., 36(6):1126-1130, May 1964. (Presented at the Division of Water and Waste Chemistry, 146th Meeting, ACS, Los Angeles, Calif., Apr. 1963.)

The polynuclear aromatic hydrocarbons synthesized in a flame during incomplete combustion of various fuels are sufficiently similar to suggest that the process of their formation is independent of the fuel used. To test this hypothesis a laboratory investigation was carried out with burner enclosed in a system which allowed controlled combustion of several dissimilar gaseous fuels and quantitative recovery of combustion products of interest. Quantitative determination of six arenes showed a constant proportional production of anthracene, pyrene, fluoranthene, benzo(a)pyrene, perylene, and benzo(e) pyrene. Analytical procedures included paper chromatography, paper-to-paper transfer, and new solvent systems which separate isomers such as pyrene and fluoranthene. The spectrofluorometer was used for quantitation of arenes after elution from the chromatogram. Types and relative quantities of arenes produced appear to depend on the temperatures of flame zones and on complexity of combustion products. (Author abstract)**

02496

J. N. Pitts, Jr., R. A. Schuck, and J. K. S. Wan.

PHOTOREDUCTION OF 2,2-DIPHENYL-1-PICRYLHYDRAZYL (DPPH) IN HYDROCARBONS. J. Am. Chem. Soc. 86, 296-7, Jan. 20, 1964.

Preliminary results of an e.p.r. investigation of the photo-induced abstraction of hydrogen atoms from hydrocarbons by 2,2-diphenyl-1-picrylhydrazyl (DPPH) are reported. Light absorption by DPPH solutions at 3130 A was determined by using the photochemical disappearance of benzophenone and the formation of acetone in isopropyl alcohol as the actinometer. In the dark no diminution of e.p.r. signal intensity was observed. During irradiation the signal decreased according to the first-order rate law. An equation for determining the reaction rates of DPPH in different hydrocarbon solvents using the quantum yield is given.**

02506

B. C. Clark, Jr.

OCCURRENCE OF NORMAL PARAFFIN HYDROCARBONS IN NATURE (TABLES AND BIBLIOGRAPHY). Woods Hole Oceanographic Institution, Mass. JULY 1966. 56 PP.
CFSTI,DDC AD 635898

Tables of annotated bibliography of occurrence of normal paraffin hydrocarbons (C(sub n) H(sub 2n plus 2) in land plants and products; land organisms; marine plants and organisms; and geologic and atmospheric samples. (Author abstract)##

02517

D. Marsh and J. Heicklen

PHOTOOXIDATION OF PERFLUOROETHYL IODIDE AND PERFLUORO-N-PROPYL IODIDE. Aerospace Corp., El Segundo, Calif., Lab. Operations. Apr. 1966. 11 pp.
DDC: AD 483914

Perfluoroethyl iodide and perfluoro-n-propyl iodide were photolysed in the presence of oxygen. In both cases, the major product is CF2O. In the C2F5I system, it is produced with a quantum yield of about 2.0. CF3CFO is also produced, but is 100 times less important. With NO present, the oxidation is drastically modified, and the RO2 intermediate must live at least 10 to the 7th sec. (Author abstract)##

02528

T. F. Thomas and C. Steel

PHOTOINITIATION OF UNIMOLECULAR REACTIONS. THE PHOTOLYSIS OF 2,3-DIAZABICYCLO(2.2.1)HEPT-2-ENE. J. Am. Chem. Soc. 87, (23) 5290-3, Dec. 1965

The gas-phase photolysis of 2,3-diazabicyclo(2.2.1)hept-2-ene (I) with 337-millimicrons light has been investigated in the pressure range 10-1000 microns. The variation in the yields of hydrocarbon products, bicyclo(2.1.0)pentane (II), cyclopentene (III), and 1,3-cyclopentadiene (IV), with pressure is consistent with the initial formation of "hot" II which can either be deactivated or isomerized to "hot" III. The latter can either undergo unimolecular decomposition to yield IV or be deactivated. Changing the wave length of irradiation from 337 to 139 millimicrons changed the relative yields of the products in a manner consistent with this "hot" molecule mechanism. (Author abstract)##

02534

R. S. Johnston and J. Heicklen

PHOTOCHEMICAL OXIDATIONS. III. ACETONE. J. Am. Chem. Soc. 86, 4259-64, Oct. 20, 1964.

The room-temperature photooxidation of acetone (0.25 to 17 mm.) in oxygen (0.09 to 9.7 mm.) with continuous UV radiation above 2200 A. was studied by the method outlined in part I of this series; observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of the reaction were H2CO, H2O2, CH3OH, and CH3OOH; minor products were CH3COOH, HCOOCH3, and higher molecular weight products which were probably CH3COCHO and CH2OCH2OH. Because of the cracking patterns of the reactants, it was impossible to establish the presence or absence of CH4, CO, CH2CO, and CO2. From the identified products at least 19 free radicals are inferred to be intermediates in this system. An exhaustive and impartial examination of all possible radical-radical disproportionation and recombination reactions indicates that the data excluded a large number of possible reactions but that 150 reactions could still be occurring. Formaldehyde, so far as these studies go, could be formed by 19 different reactions. Thus, this experimental method cannot give a complete mechanism, nor can any method that simply analyses all molecular products. (Author abstract) ##

02535

H. S. Johnston and J. Heicklen

PHOTOCHEMICAL OXIDATIONS. IV. ACETALDEHYDE. J. Am. Chem. Soc. 86, 4258-8, Oct. 20, 1964.

The room-temperature photooxidation of acetaldehyde (0.8 to 18 mm.) in oxygen (1.0 to 9.2 mm.) with continuous UV radiation above 2200 A was studied by the method outlined in part I of this series. Observations were made by leaking the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of reaction were CH3OH and presumably CO and CO2; other products were H2O2, CH2O, HCOOH, CH3OOH, CH3COOH, CH3OOCH3, and probably CH3C(O)OOH. Because of the cracking patterns of the reactants, it was impossible to establish the presence or absence of CH4, CH2CO, CO, and CO2. Oxidation of the primary radicals, CH3 and HCO, leads to CH3OO, CH3O, HO2, and HO2, and probably HCO(OO) and HCOO. There are at least six radicals in this system that can disproportionate in 36 ways and undergo other reactions. Thus this reaction is much too complicated for its mechanism to be revealed merely by analysis of all products. (Author abstract) ##

02734

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION (SIXTEENTH PROGRESS REPT. JULY 1 TO DEC. 31, 1965.) California Inst. of Tech., Pasadena, Chemical Engineering Lab. 1966. 16 pp.

During the period covered by this report, primary effort was directed to the investigation of the effect of the nature of fuels upon the formation of the residual quantities of the oxides of nitrogen and upon the microscopic nature of the perturbations resulting therefrom. Tables summarize results of these studies. Table I sets forth the experimental conditions in connection

with the investigation of the behavior of the propane-air and the n-butane-air system. In Table II, the composition of the reaction products of the ethane-air system propane-air and n-butane-air systems are summarized. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is given in Table III. Plans for continuation of these studies upon the renewal of the Public Health Service Grant No. AF-00108-08 are discussed.

02802

E. Sawicki, T. R. Hauser, and S. McPherson

SPECTROPHOTOMETRIC DETERMINATION OF COMPOUNDS CONTAINING THE P-HYDROXYSTYRENE GROUP. 3-METHYL-2-BENZOTHIAZOLINONE HYDRAZONE PROCEDURE. Preprint. 1961.

3-Methyl-2-benzothiazolinone hydrazone is a versatile analytical reagent which has been used to detect, characterize and determine trace amounts of various types of strongly nucleophilic organic compounds. The mechanism of the present test is difficult to ascertain. Two possibilities are that the reagent attacks the beta-carbon atom in the p-hydroxy-styrene derivative or that the latter derivative splits at the ethylene double bond to produce at least one aldehyde which then reacts with the reagent to form a blue formazan cation. Spectrophotometric Procedure.--To 1 ml of the methanolic test solution was added 1 ml of the MBTH reagent followed by 2 ml of the ferric chloride solution. The mixture was allowed to stand for 15 minutes and then diluted to 10 ml with methanol. Absorption measurements were taken at the wave length maxima. The blank was colored light greenish yellow. Spot Plate Procedure. -- To 1 drop of methanolic test solution was added 1 drop of the MBTH reagent followed by 1 drop of the ferric chlorid solution. The mixture was allowed to stand for 5 minutes. A positive reaction is shown by a blue-green color. The blank was pale greenish yellow. The test is highly selective for phenols containing a p-vinyl type group as compared to phenols without a vinyl group. It is possible that phenols with an o- or m-vinyl type group will react as phenols to give a red-orange color. A p-hydroxystyrene derivative in which a methylene group is placed between the ethylene double bond and the benzene ring gives practically no reaction.##

02803

E. Sawicki

SPOT TEST DETECTION AND SPECTROPHOTOMETRIC DETERMINATION OF MICROGRAM AMOUNTS OF ALDEHYDES AND ALDEHYDE-YIELDING COMPOUNDS -- A REVIEW. Microchem. J., Symp. Ser. 2, 59-106, 1962. (Presented at the International Symposium on Microchemical Techniques, University Park, Pa., Aug. 13-18, 1961.)

This review covers recent advances in the detection, characterization, and determination of trace amounts of aldehydes. Some of the well-established methods are also discussed and compared with the newer methods. The analysis for non-aldehydic compounds from which an aldehyde can be obtained is discussed in the section concerned with that particular aldehyde. Discussion of general tests is followed by discussion of the more

highly selective methods. Where possible, a mechanism for each procedure is included, for only with a knowledge of the structure of the final chromogen and its manner of formation can a thorough scientific study of the procedure be made. An attempt has been made to present identification limits, spectrophotometric constants, interferences, and other appropriate data for all procedures. In many of the procedures submicrogram amounts of aldehydes can be detected and with the use of microcells submicro amounts can also be determined.##

02812

P. Urone, J. E. Smith, and R. J. Katnik

GAS CHROMATOGRAPHIC STUDY OF SOME CHLORINATED HYDROCARBONS. Anal. Chem. 34, 476-80, Apr. 1962.

The gas chromatographic behavior of 11 chlorinated hydrocarbons was studied on six columns and at four temperatures for possible qualitative and quantitative applications. Paraffin and Apiezon L columns gave good qualitative and quantitative performances. Peak area measurements were accurate to plus/minus 0.02 in the 0- to 5 microcoulomb range. Carefully measured specific retention volumes made possible the calculation of partition coefficients, activity coefficients, and excess partial molal heats of solution. For column substrates with indefinite molecular weights, such as paraffin and Carbowax, relative activity coefficients were calculated. (Author abstract)##

02817

C. S. Tuesday

THE ATMOSPHERIC PHOTOOXIDATION OF TRANS-BUTENE-2 AND NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1961. 35 pp. (Presented at the International Symposium on Chemical Reactions in the Lower and Upper Atmosphere, San Francisco, Calif., Apr. 10-20, 1961.)

To elucidate the mechanism of the atmospheric photochemical reactions of olefins and nitrogen oxides, the reactions that occur upon the irradiation of oxygen-nitrogen mixtures containing several parts per million of nitric oxide and trans-butene-2 were investigated. Trans-butene-2 was used as a model olefin because of its symmetry and relatively rapid reaction rate. The effects of several variables on the rates of trans-butene-2 disappearance and nitrogen dioxide formation were determined together with the effect of these variables on the concentrations of reaction products. Reaction variables investigated include nitric oxide, nitrogen dioxide, trans-butene-2, and oxygen concentrations as well as light intensity and total pressure. A reaction scheme is proposed to rationalize the observed effects these reaction variables have on the rates of trans-butene-2 and nitric oxide photooxidation and on the concentrations of reaction products. The experimental results support the general conclusion that a free radical chain reaction initiated by the reaction of oxygen atoms with trans-butene-2 is very important in the atmospheric photo-oxidation of trans-butene-2 and nitric oxide.##

02830

W. A. Glasson, and C. S. Tuesday

THE ATMOSPHERIC THERMAL OXIDATION IN NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1963. 18 pp. (Presented in part at the 145th National Meeting, American Chemical Society, Los Angeles, Calif., Apr. 5, 1963.)

The kinetics of the thermal oxidation of NO in oxygen nitrogen mixtures have been determined in the parts-per-million range by long-path infrared spectrophotometry. The results of this investigation indicate that the reaction is second-order in NO, first-order in oxygen, and independent of the concentration of added NO2, with a third-order rate constant, at 25 C, of 1.57 (plus or minus .09) times 10 to the minus 9 power per (sq ppm - sec). It is concluded that the kinetics of the thermal oxidation of NO are adequately described by a simple third-order rate law and do not require the complexities suggested by Treacy and Daniels. In addition, it was found that there is no effect on the rate of the thermal oxidation due to either (a) addition of several olefins or (b) photolysis of the product NO2. (Author abstract)##

02851

E.R. Stephens

THE ROLE OF OXYGEN ATOMS IN THE ATMOSPHERIC REACTION OF OLEFINS WITH NITRIC OXIDE. Intern. J. Air Water Pollution 10, (11-12) 793-801, Dec. 1966.

The photoconversion of nitric oxide to nitrogen dioxide in the presence of olefin at low concentrations in air was studied with two objectives: (1) to test the hypothesis that oxygen atoms are the principal reagents attacking the olefin in the absence of ozone; and (2) to determine the average number of nitrogen dioxide molecules formed for each molecule of olefin consumed to see whether the conversion has the aspects of a chain reaction. On the basis of the O-atom hypothesis it is predicted that the rate of oxidation of a given olefin should be proportional to the product of the light intensity and the nitrogen dioxide concentration. It should not be affected by the addition of a second olefin. This was found to be nearly true for a wide variety of reaction conditions. About one to two nitrogen dioxide dioxide molecules were formed for each molecule of propene oxidized.##

02852

F. Masuda, H. Kuratsuno

PHOTOCHEMICAL OXIDATION OF BENZO(A)PYRENE. Intern. J. Air Water Pollution (Presented at the 23rd Annual Meeting, Japanese Cancer Association, Tokyo, Japan, Nov. 11, 1964.) 10 (11-12):805-11, Dec. 1966.

Benzo(a)pyrene dissolved in benzene was irradiated by UV light of wave length greater than 280 millimicrons. Oxygen was present in the benzene. The irradiation product was fractionated by alumina column chromatography, isolating three crystalline compounds. These compounds were determined as 6,12-benzo(a)pyrenequinone, 1, 6-benzo(a)pyrenequinone and 3,6-benzo(a)-pyrenequinone by their melting points, data of elementary analysis, and IR as well as UV absorption spectra. AA##

02935

E. Matijevic, S. Kitani, and M. Kerker

AEROSOL STUDIES BY LIGHT SCATTERING. II. PREPARATION OF OCTANOIC ACID AEROSOLS OF NARROW AND REPRODUCIBLE SIZE DISTRIBUTIONS. J. Colloid Sci. 19, (3) 223-37, Mar. 1964.

Octanoic acid aerosols, in the submicron range and of narrow size distribution, were produced with excellent reproducibility when nucleated with silver chloride evaporated in a combustion furnace. The particle size distribution could be determined uniquely and with high precision from light scattering data using the polarization ratio method described in the preceding paper. The effects of the flow rate of the carrier gas, the nuclei concentration, the temperature of the furnace used for making the AgCl nuclei, and the temperature of octanoic acid in the boiler upon the size distribution of the aerosol were systematically investigated. With increasing flow rate at constant boiler temperature both the particle size and the polydispersity decrease. At a constant flow rate the particle size becomes larger with increasing boiler temperature while the polydispersity remains practically constant. Particle size also increases with decreasing furnace temperature and dilution of nuclei. (Author abstract) ##

01009

P. de Mayo

THE PHOTOCHEMISTRY OF UNSATURATE SYSTEMS CONTAINING HETERO ATOMS OTHER THAN OXYGEN (FINAL REPT. SEPT. 1965-MAY 1966). Western Ontario Univ., London, Canada, Dept. of Chemistry. 6 pp., 1966

This report presents a summary of a study of the products and mechanisms of reactions wherein unsaturated systems containing nitrogen or sulfur are photolysed. Included are studies of (1) the photochemical Beckmann rearrangement, (2) the general heteroatom transfer, (3) coumalin dimerization, and (4) the photolytic decomposition of β-ketosulphones.##

03062

S. W. Benson and G. B. Haugen.

ESTIMATED ACTIVATION ENERGIES FOR THE FOUR-CENTER ADDITION REACTION OF H2, HBr, AND Br2 TO ACETYLENES. J. Phys. Chem. 70, (10) 3336-8, Oct. 1965

The application of an electrostatic model to predict the activation energy of the four-center addition reactions of acetylene is discussed. The transition state is considered an intimate ion-ion pair with an equivalent charge separation of plus or minus formal charge. The energy of activation can be equated to the electrostatic energy of interaction of point dipoles. Values obtained for the reacting substances (acetylene, methyl acetylenes, hydrogen halides, hydrogen, fluorine, chlorine, bromine, iodine) are tabulated. The activation energy for the molecular addition to acetylenes is about 1.5 kcal/mole easier than that for the corresponding olefin.##

03066

D. Durant and G. P. McMillan.

ENERGY DISTRIBUTION OF PHOTOCHEMICALLY GENERATED T-PENTOXY RADICALS. J. Phys. Chem. 70 (9) 2709-13, Sept. 1966.

Previous studies on excited alkoxy radicals formed in photochemical processes were extended to the t-pentoxy species, which is well known to decompose by two parallel paths. The ratio of rate constants k sub 1/k sub 2 was estimated to be 104 at 118 degrees from experiments on pyrolysis of t-pentyl nitrite. For radicals formed by photolysis of this compound, k sub 1/k sub 2 depends strongly on the absorbed wavelength but does not reach the expected limiting value of 104 at the longest wavelength which could be studied. The dependence of quantum yields at 3660 A on pressure of an added scavenger, nitric oxide, showed that the k sub 1/k sub 2 obtained from photochemical experiments could be accounted for quantitatively by a contribution from excited radicals and a contribution identical with the ratio for unexcited radicals, obtained from pyrolysis experiments. These results provide limited justification for the "alpha method" often used in kinetic treatment of excited radical effects. Quantum-yield measurements at high pressures of added nitric oxide suggest preferential removal of excited radicals of lower energy and disclose a broad energy distribution of the excited radicals. (Author abstract)##

03067

B. N. Golden, A. S. Rodgers, and S. W. Benson

THE KINETICS AND MECHANISM OF THE REACTION I2 PLUS C3H6 = C3H5I PLUS HI AND THE HEAT OF FORMATION OF THE ALLYL RADICAL. J. Am. Chem. Soc. 88, (18) 3196-8, July 20, 1966

The reaction I2 with C3H6 was followed spectrophotometrically in the gas phase between 200 and 300 degrees. By making use of the equilibrium constant for the system and the usual mechanism for such reactions, a value was obtained for the rate constant for I-atom abstraction of an allylic hydrogen from propylene, log sub 8 (l/mole sec) = (10.25 plus or minus 0.19) - (10.04 plus or minus 0.32)/theta. From this activation energy and values for the heats of formation of C3H6, I2, and HI, a value of the allylic stabilization energy of 10.2 plus or minus 1.5 kcal/mole is obtained. The difference in stabilization energies of methylallyl and allyl radicals is considered. Differences in A

factors for reactions of the type RH plus I yielding R plus HI are discussed in terms of the entropy of the transition state. (Author abstract)##

01078

A.S. Rodgers, D.M. Golden, S.W. Benson

THE THERMOCHEMISTRY OF THE GAS PHASE EQUILIBRIUM IA PLUS CH'A EQUALS CH3I PLUS HI. J. Am. Chem. Soc. 88, (14) 3194-8, July 20, 1966

A Cary spectrophotometer was used to obtain the equilibrium constant for the the reaction CH3A plus IA equals CH3I plus HI between 200 and 300 degrees. The heat of formation obtained for allyl iodide, g, was 33.9 plus or minus 0.6 kcal/mole. Equilibrium values calculated were 8.31 plus or minus 0.23 kcal/mole at 527 degrees, or 7.96 plus or minus 0.23 at 298 degrees. Entropy values at 527 degrees were -1.00 plus or minus 0.46 gibbs/mole or, at 298 degrees, -1.91 plus or minus 0.80 gibbs/mole. Second law values for the heat of formation for allyl iodide,g, are 31.56 plus or minus 0.25 kcal/mole and, for entropy, 78.01 plus or minus 0.00 gibbs/mole. The heat of formation values compare well with previously measured values, but the entropy calculation yields agreement with higher bond additivity and supports third law values.##

01088

B. Walsh S.W. Benson

KINETICS AND MECHANISM OF THE GAS PHASE REACTION BETWEEN IODINE AND FORMALDEHYDE AND THE CARBON-HYDROGEN BOND STRENGTH IN FORMALDEHYDE. J. Am. Chem. Soc. 88, (20) 4570-5, Oct. 20, 1966

The gas phase reaction of iodine with formaldehyde was investigated spectrophotometrically in the temperature range 180-300 degrees. The reaction is very clean, giving CO and HI as the only products except at very high conversions at the lowest temperatures, when a little CHIF is formed as a side product. A reaction mechanism is presented in the text. Kinetic measurements over a wide range of initial conditions indicate that the rate-determining step is I. plus CH2O yields CHO plus HI, and log k sub 4= 10.92-17.4J theta, where theta 2.303 RT in kcal/mole. Further measurements of the inhibiting effect on HI on the reaction suggest that the back activation energy for step 4 is 1.5 kcal/mole. This difference in forward and back activation energies establishes a bond strength of 87.0 kcal/mole. The value implies a dative pi-bond energy in carbon monoxide of 60.5 plus or minus 2 kcal/mole, in good agreement with other estimates.##

03107

E.W. Neubel L.A. Gipperton

OXIDES OF NITROGEN AND UNBURNED HYDROCARBONS PRODUCED DURING CONTROLLED COMBUSTION. J. Air Pollution Control Assoc. 15, (6) 270-3, June 1965.

A diffusion flame burner was operated to determine the effect of several parameters on the quantity of NOx and unburned hydrocarbons produced. The statistical analysis indicated the unburned hydrocarbon emissions to be dependent upon the rate of heat release in the system, the amount of excess combustion air, the fuel molecular structure, and the interaction between the fuel structure, and the amount of excess air. The NOx emissions reached a maximum at the conditions which yielded minimum unburned hydrocarbon emissions. Multiple regressions were made which yielded predicting equations for both the unburned hydrocarbon and the NOx for the apparatus used. (Author abstract)##

03118

W.A. Glasson C.S. Tuesday

HYDROCARBON REACTIVITY AND THE KINETICS OF THE ATMOSPHERIC PHOTOOXIDATION OF NITRIC OXIDE. General Motors Corp., Warren, Mich., Fuels and Lubricants Dept. (Research Publication GMR-586) Aug. 19, 1966. 23 pp. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

The reactivity in the atmospheric photooxidation of NO has recently been determined for a large number of hydrocarbons. To aid in the application of these hydrocarbon reactivity measurements, the kinetics of the atmospheric photooxidation were studied. The hydrocarbon investigated covered a wide range of reactivities and structures and included: 2,3-dimethyl-2-butene, 2-methyl-2-butene, 2-methyl-1-pentene, propylene, acetylene, and n-hexane. The rate of NO photooxidation increases less than linearly with hydrocarbon concentration for all the hydrocarbons studied. The degree of non-linearity, however, varied with hydrocarbon structure and reactivity. The effect of the NO and the NO2 concentrations on the rate of NO photooxidation also depended somewhat on hydrocarbon structure and reactivity. For all of the hydrocarbons studied, however, the NO photooxidation rate increased linearly with increased light intensity. The effect of complex hydrocarbon mixtures on the rate NO photooxidation was investigated using 3 commercial gasolines. The NO photooxidation rates measured for these mixtures agreed within experimental error with calculated rates based on chromatographic analyses of the gasolines and the reactivity in NO; photooxidation of the individual hydrocarbons in the gasolines. (Author abstract)##

01184

A. V. Ong and R. I. Schiff.

THE PHOTOLYSIS OF CO2 AT 470 A. Can. J. Chem. 44, 1931-91, 1966.

The apparatus used to study the photolysis contained a collimating region which eliminated the effect of divergent light, and permitted the temperature of the cell and lamp to be controlled separately. Analytical sensitivity was such that conversions less than 0.2% were possible. Although CO and O2 were the only stable products, the CO/O2 ratios were higher than those required by mass balance. The product yields were found to be independent of CO2 pressure and to be linear with irradiation time at 25 C. At higher temperatures the quantum yields decreased and at 200 C were no longer linear functions of irradiation time. The O2 yields decreased when CO was added, the effect increasing with temperature. The overall quantum yield was less than unity. Reactions were observed with CH4, H2, and H2O when these were added in small amount. These results indicated the presence of a reactive species, capable of promoting back reactions and of being adsorbed on the walls. A mechanism is suggested which best fits the results and which postulates CO1 as the reactive species. (Author abstract) 22

01191

HYDROCARBON - AIR FUEL CELLS (SEMI-ANNUAL TECHNICAL SUMMARY REPORT NO. 3, JAN. 1 - JUNE 30, 1966). General Electric Co., Lynn, Mass. (Order No. 247). 1966. 238 pp.
CFSTI, DDC 600 $21

Electrocatalyst Research: A portion of the research effort was directed towards the understanding of the complex processes occurring at hydrocarbon anodes. Surface species were identified as partially dehydrogenated radicals derived from fuel, cracking products and partially oxygenated species. Some are particularly refractory and contribute to limitations on performance. In all cases, the anodic performance is strongly influenced by the adsorption rate, the ability of the catalyst to promote cracking, and the reaction of C(1) radicals with water. Accumulation of the refractory species results in the lowering of maximum currents. For economic reasons, long term goals indicate the use of non-platinoid electrocatalysts in fuel cell electrodes. At present, work is being concentrated on more effective utilization of the noble metals, especially Pt, Pt-Ru, Pt-Ir, and ternary alloys of Pt, Ru and Au were evaluated as high area catalysts in thin porous electrodes, with 85% H3PO4 electrolyte, and propane and octane fuels. None showed significant improvement over Pt used alone. Better results with these alloys were obtained with H2-CO fuel mixtures. Electrodes: Emphasis in this area is on the development of electrode structures which employ the catalysts developed from the above mentioned research. Basic electrode structure is the thin porous Niedrach-Alford types. Major effort was directed toward RHC supported catalysts. Multi-Component Fuels: Plans are to include research on mixtures of saturated hydrocarbons, olefins,

aromatic hydrocarbons as well as the reference fuel of octane. Electrolytes: The principal electrolyte has been concentrated H_3PO_4. HF was used as an alternate electrolyte and did not show the same tendency to cycle as the H_3PO_4 electrolyte.##

03434

C. S. Tuesday.

THE ATMOSPHERIC PHOTOOXIDATION OF OLEFINS: THE EFFECT OF NITROGEN OXIDES. General Motors Research Labs, Warren, Mich., 1961, 25 pp. (Presented at the Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5-7, 1961.) (Rept. No. GMR-155.)

The role of the oxides of nitrogen in the atmospheric photooxidation of olefins was further investigated. A previous study from this laboratory indicated, among other things, that the photooxidation of trans-2-butene was both promoted and inhibited by nitric oxide depending upon the concentration. To explain and extend this observation, the effects of various concentrations of NO_2 and NO on the photooxidation rates of propylene, isobutene, trans-2-butene, and 2,3 dimethyl-2-butene were determined together with the effects of NO concentration on reaction products. The olefins investigated differed not only in photooxidation rate for a particular NO_2 concentration but also in the dependence of this rate on the initial concentration of NO_2. Initial increases in NO_2 concentration increased the photooxidation rate of all the olefins studied. When the initial NO_2 concentration was increased further each olefin behaved differently. The photooxidation rates of trans-2-butene and tetramethylethylene increased with increasing concentrations of NO up to a maximum rate. Further increases in the initial concentration of NO reduced the photooxidation rate of both these olefins. Further increases in NO concentration inhibit the olefin photooxidation rate by decreasing the concentration of ozone and the rate of the ozone-olefin reaction. The decreased rate of ozone plus olefin reaction also decreases the rate and amount of compound X formation since compound X is apparently formed by further reactions of some of the products of the ozone plus olefin reaction. The role of the oxides of nitrogen in the atmospheric photooxidation of olefins is quite complex. NO promotes or inhibits olefin photooxidation depending upon the ratio of reactants. NO_2 promotes or inhibits olefin photooxidation depending both on the relative concentration of reactants and the nature of the olefin.##

03446

B. H. Crocco and E. W. Layhe.

THERMODYNAMIC, TRANSPORT, AND FLOW PROPERTIES FOR THE PRODUCTS OF METHANE BURNED IN OXYGEN-ENRICHED AIR. National Aeronautics and Space Administration, Langley Station Hampton, Va., Langley Research Center. (Rept. No. NASA SP-3015.) 1966. 90 pp.
CPSTI, NASA: SP-3015

In testing materials for resistance to extremely high-temperature oxidizing environments, large-scale hypersonic test facilities for simulating flight environments to which some of these materials may be exposed are used. Combustion heating of a high-pressure airstream is one of the approaches used in this simulation. It is sometimes desirable to maintain burning in a test gas in order to determine the effect of oxidation on materials in the test gas. As combustion-product oxygen percentages approaching those in air (20% by vol) are required, the need for data on the properties of a combustion-heated, oxygen-enriched test medium is obvious. The present paper presents results of the data obtained on the properties of methane burned with oxygen-enriched air. These include calculations to determine the composition and the thermodynamic, transport, and flow properties (including normal-shock properties) of gas mixtures. These properties are computed for methane burned in air enriched with oxygen so as to maintain approximately 20% oxygen in the combustion products. Results are presented for equivalence ratios of 0.315, 0.380, 0.425, 0.480, and 0.525, for pressures varying from 0.0001 to 1000 atmospheres and for temperatures from 100 K (560R) to 6000 K (10800R). (Author summary)##

03H08

J. Heicklen and H. S. Johnston

PHOTOCHEMICAL OXIDATIONS. I. ETHYL IODIDE. J. Am. Chem. Soc. 84, 4308-4313, Dec. 5, 1962.

The room temperature (25 plus or minus 2 degrees) photo-oxidation of ethyl iodide (0.05 to 2.0 mm.) in oxygen (2.0 mm.) with continuous radiation (usually above 2200 A.) was studied by irradiation in a cylindrical volume with a pinhole leak directly into a Bendix model 14 time-of-flight mass spectrometer. The initial products observed are C_2H_5OH, CH_3CHO, and I_2 in large amounts and $C_2H_5OOC_2H_5$, C_2H_5OOH, and C_2H_5OI in small amounts. Because of the cracking pattern of the reactants, it was impossible to establish the presence or absence of CH_4, C_2H_2, C_2H_6, $HCHO$, CO_2 and HI. From mass balance HI was believed to be a minor initial product. A fairly satisfactory nine-step mechanism can be found for the initial rate data, and several ratios of rate constants were evaluated from the data. The reaction was studied to about 3% completion, at which point diffusion of products through the pin-hole balanced the rate of photochemical production. The rate of attainment of this steady state and the steady-state pressures gave additional information beyond that found for the initial rates. The reaction at a few percent conversion of ethyl iodide is much more complex that the initial reaction; there is secondary production of alcohol, strong secondary destruction (perhaps largely heterogeneous) of C_2H_5OOH and C_2H_5OI, and slight over-all inhibition by I_2. Water was observed as a secondary product, coming in after a pronounced induction period. Even with a 19-step mechanism, all features of the reaction at 3% completion could not be explained. Although considerable effort was directed toward finding ozone in this system, it was never present in an amount as great as 10 to the minus 6th power. (Author abstract)##

R. C. Cookson

ASYMMETRIC ELECTRONIC TRANSITIONS AND PHOTOCHEMISTRY. (Final Technical Status Report). Southampton Univ., England, Dept. of Chemistry. Nov. 1965. 16 pp.
DDC: AD 479 240

Sigma to sigma transitions of organic compounds have been observed for the first time in the region of 210 to 260 millimicrons. Delocalisation of the sigma electron requires a chain of 4 atoms, the first and fourth having p orbitals parallel with the sigma bond joining the second and third. Examples are reported amongst unsaturated ketones, unsaturated amines and amino-ketones. The circular dichroisms of 3 alpha- and 3 beta-phenyl-2,3 - ethylenedithio-cholestane and of some conjugated oximes is reported. The sign of rotation of the latter depends on the helicity of the chromophore in the same way as for alpha, beta unsaturated ketones. UV irradiation of hexamethylcyclohexane - 1,3,5-triene results in successive decarbonylation and beta-diketone - enol - lactone rearrangements. Photochemical isomerisation of four optically active camphenones involves intramolecular migration of the carbonyl group from one end to the other of the olefinic group, converting the bicyclo (2,2,1) heptenone into the bicyclo (3,2,0) heptenone system. The photoproducts show the high values of delta E characteristic of extensive mixing of p to pi and pi to pi transitions. (Author abstract) ##

03535

V. G. Matusk

VAPOR PRESSURE AND EVAPORATION OF SUBSTANCES IN POTABLE AIR. Gigiena i Sanit., 22, (3) 35-41, 1957.
DDC: AD 425408

A description is given of a nomogram for the determination of saturated vapor pressure and a method of calculating the rate of evaporation of various chemically pure substances in moving air. The potential danger of toxic substances may be evaluated and industrial ventilation requirements may be calculated using this nomogram. ##

03559

R. E. Rebbert and P. J. Ausloos.

COMPLICATING FACTORS IN THE GAS PHASE PHOTOLYSIS OF ACETONE. J. Phys. Chem. 67, 1925-8, 1963.

In a recent publication of the gas phase photolysis of acetone, Yuby and Weins suggested a new ethane-producing reaction: $2CH_3$ yields C_2H_6 plus 2M (a). On the other side, Rebbert and Ausloos presented evidence for the formation of ethane by a unimolecular elimination from acetone CH_3COCH_3 plus hv yields C_2H_6 plus M2 (b). The present study was undertaken in order to determine if the pressure trends observed by Yuby and Weins could not at least be partly accounted for by the

occurrence of primary process (b). It is thought that an answer to this question, as well as to other related problems, could be most readily obtained by photolyzing equimolar mixtures of CH3NO2-CH3ONO. It was considered that reaction (a), which has been proposed by Toby and Weinz to account for the observed pressure effect, has not been clearly established.##

03575

B. B. Austin, B. H. Levin, and B. Donaldson, Jr.

A NEW ATMOSPHERE IRRADIATION CHAMBER. Intern. J. Air Water Pollution 5, (304) 237-46, 1961.

The irradiation of atmospheric samples of air with ultraviolet light produces oxidants when hydrocarbons and nitrogen dioxide are present and thus permits a measurement of the smog-forming potential of the air. A new high irradiation intensity chamber using fluorescent ultraviolet lamps has been developed. Data are given for the irradiation of some hydrocarbons in air in the presence of nitrogen dioxide. Some data are also given for atmospheric samples. The performance of the new chamber is compared to that of the fifty-liter chambers which have been in use in the past. The chamber volume is eight liters. Power required has been reduced from 1600 watts in the fifty-liter chamber to 160 watts. Oxidant levels produced at the same sampling rate on atmospheric samples are approximately equivalent to the levels produced in the fifty-liter chamber. (Author abstract)##

03588

G. H. Richter, H. H. Reamer, and B. H. Sage

EFFECTS OF STABILITY OF COMBUSTION ON THE FORMATION OF THE OXIDES OF NITROGEN. California Inst. of Tech., Pasadena, Chemical Engineering Lab. Aug. 30, 1960. 111 pp.

It has been established that the nitrogen oxides are undesirable products of combustion processes from the standpoint of air pollution. An investigation concerning the effect of perturbations during combustion upon the formation of the oxides of nitrogen was carried out upon a premixed flame, utilizing air and natural gas as reactants. The first part consisted of concentration measurements by which the effect of audible oscillatory combustion upon the residual quantities of nitrogen oxides in the products of reaction was determined. The second part comprised more carefully controlled and quantitative measurements by which the microscopic variations in conditions in the combustion zone were evaluated as a function of time and the effect of the variations upon the residual quantities of the nitrogen oxides was determined. The results indicate that perturbations in the combustion process exert a pronounced influence upon the formation of the nitrogen oxides. However, the nature of the oscillatory combustion appears sensitive to environment, and it is difficult to maintain sufficiently steady macroscopic conditions to avoid large variations with time in the microscopic perturbations. The variation in the mole fraction of nitrogen oxides in the products of reaction under carefully

controlled conditions was an order of magnitude less than that encountered under the less well controlled conditions of combustion. (Author abstract modified)##

03985

R. C. Galeaja

STUDIES OF COMBUSTION PROCESSES LEADING TO IGNITION OF SOME OXYGEN DERIVATIVES OF HYDROCARBONS. Combust. Flame 10, (1) 11-21, March 1966.

The pre-flame and ignition behaviors of several related oxygen derivatives of hydrocarbons, acetic acid, methyl formate, methyl acetate, ethyl acetate, methyl propionate, propionic acid, ethyl formate, acetyl acetone, and acetic anhydride were investigated. Mechanisms proposed to explain observed differences are discussed in relation to: (1) a carbonyl group causes greater activation of adjacent alkyl groups than does an oxygen atom in an ether linkage; (2) peroxy radicals formed in the initial stages of oxidation can readily undergo 1,5 and 1,6 intramolecular transfer; (3) the oxygen atom in the carbonyl group tends to form hydrogen bonds intramolecularly. With acetic acid, the combustion process appeared more exothermic than of any hydrocarbons studied. Methyl formate ignited at a much lower temperature than acetic acid, with explosive violence; also greater amounts of methane and methanol were produced than by acetic acid at corresponding pre-flame stages; while CO2 is formed in greater amounts than CO from methyl formate, the reverse is true with methyl acetate. In comparison with methyl acetate, ethyl acetate began to oxidize at a slightly higher temperature but ignited at a considerably lower temperature with explosive violence. In comparison with ethyl acetate, methyl propionate began to oxidize at a lower temperature but its extent of reaction increased less with temperature, and it eventually ignited at a higher temperature. Methyl propionate produced more CO2 than CO until slightly below ignition temperature than ethyl acetate. Analysis of gaseous oxidation products of propionic acid and ethyl formate showed that acetaldehyde was formed in larger amounts from propionic acid and ethylene was formed in larger amounts from ethyl formate. Diacetyl treat to hydrocarbons oxidizing in the "slow temperature" region, diacetyl oxidation in the low temperature region. Acetic anhydride was even more reactive than diacetyl and showed no zone of negative temperature coefficient. In its oxidative degradation, CO was formed in considerable amounts before any consumption of O2 could be detected.##

03986

R. A. Davies D. B. Scully

CARBON FORMATION FROM AROMATIC HYDROCARBONS II. Combust. Flame 10, (2) 165-70, June 1966.

Previous work on the yields of carbon black from aromatic hydrocarbons by injection of their vapours into the products of

combustion of a rich town gas-air premixed flame has been continued. Yields from toluidines are higher than from aniline. The yields from cresols are the same as from phenol. The addition of oxygen to benzene and toluene decreases the yields, which eventually become the same, indicating preferential oxidation of the side chain. The NO2 group in nitrobenzene does not alter the amount of soot formed relative to that from benzene. Acetylene forms soot much less readily than benzene. Cyclopentadiene does not form soot, but indene does so readily. Styrene, ethylbenzene and naphthalene have also been studied. (Author summary) 66

03969

J. G. Christian and J. E. Johnson

CATALYTIC COMBUSTION OF ATMOSPHERIC CONTAMINANTS OVER HOPCALITES. Intern. J. Air Water Pollution 9, (1/2) 1-10, Feb. 1965.

Catalytic combustion studies showed hopcalite, an unsupported coprecipitate of copper and manganese oxides, to provide substantially complete oxidation at ca. 300 C of vapors of several types of hydrocarbons, oxygenated compounds, nitrogen compounds, and halogenated compounds. The lower molecular weight hydrocarbons proved resistant to oxidation; methane was oxidized only to the extent of 10 per cent even at 400 C. The organic nitrogen compounds produced the theoretical amount of CO2 as well as appreciable amounts of nitrous oxide (N2O). Ammonia produced 70% nitrous oxide at 315 C, and about 2% nitrogen dioxide (NO2). The decomposition of organic halogen compounds ranged from slight in the case of Freon-12 to virtually complete for methyl chloroform. In addition, new organic halides were formed by the oxidation of methyl chloroform and Freon-11. There is at least partial retention of halogen on the catalyst when Freon-114B2 and Freon-11 are decomposed. Aerosols of dioctylphthalate, a hydrocarbon-type lubricating oil, and a tricresylphosphate ester lubricant were quantitatively oxidized by hopcalite at 300 C. (Author abstract) 66

04022

C. N. Kimberlin, R. T. Struck, J. R. Evans, C. P. Constanza, and D. Gorin

MOLTEN SALT CATALYSTS FOR HYDROCRACKING OF POLYNUCLEAR HYDROCARBONS. Ind. Eng. Chem. Process Design Develop. 5, (2) 151-7, Apr. 1966.

Batch autoclave tests have shown molten salts which are Lewis acids to be superior catalysts for hydrocracking polynuclear aromatics when used in high concentrations. These catalysts are compared with conventional supported catalysts for conversion of pyrene and a refractory hydrocracking residue from coal. Zinc chloride and aluminum bromide give high rates of conversion along with a high iso- to normal isomer distribution. Tin chloride is a very weak Lewis acid and is relatively inactive. In spite of the high cracking activity of these salts, no added hydrogenating catalyst is needed. Zinc chloride, in contrast to AlBr3, is

relatively inactive for hydrogenation and hydrocracking of single-ring aromatics producing a high yield of gasoline. Boiton salts are deactivated by basic nitrogen; but are much more resistant than supported dual-function catalysts. (Author abstract)##

64201

C. P. Fenimore and G. W. Jones

OXIDATION OF SOOT BY HYDROXYL RADICALS. J. Phys. Chem. 71, (3) 593-7, Feb. 1967.

The mechanism of oxidation of soot is investigated. The soot was obtained by burning ethylene gas in two burners in series using a fuel-lean mixture. In flame gases of temperatures from 1510-1890 degrees K and PO2 approximately 0.0001 to 0.1 atmos, the rate of soot oxidation does not depend very strongly on PO2. The observations are consistent with the assumption that about one tenth of the collisions of OH with the soot remove a carbon atom, the number of collisions being calculated from POH by kinetic theory.##

642201

F. Goldfinger, G. Huybrechts, and L. Meyers

THE CHLORINE PHOTOSENSITISED OXIDATION OF HYDROCARBONS AT LOW TEMPERATURES (FINAL TECHNICAL REPT.). University Libre de Bruxelles, Belgium, Laboratoire de Chimie Physique. Jan. 1966. 30 pp.

The study of the chlorine photosensitised oxidation of trichloroethylene has been completed. A mechanism has been proposed for this reaction where dichloroacetyl chloride is the main reaction product and the rate constants of the relevant elementary reaction steps were estimated. This together with preceding studies on the oxygen effect on the photochlorination of ethane and trichloroethylene has led to a reaction theory which seems to be of general validity. In the second part of this report a new reaction theory of chlorine photosensitised oxidation of hydrocarbons is presented which describes many of the kinetic investigations that have been carried out by the present work and reported in the literature. Due to the diversity of radicals in the reaction mechanism and the formation of different products not sufficiently unreactive, the reaction mechanism is not in final form and more experimental work is needed. (Author abstract)##

64255

N. S. Ryzhovskaya and R. N. Nakadoshskaya

OPREDELENIYE OF ALIPHATIC AMINES IN AIR. (Za metodike opredeleniya alifaticheskikh aminov v vozdukhe.)) Hyg. Sanit. 31, (8) 321-325, Aug. 1966; Trans. (Tr.) CFSTI: $ 66-61160/7-8

In studies of the primary aliphatic amines, optimum conditions were studied for their determination with ninhydrin, potassium 1, 2-naphthoquinone-4-sulfonate and p-nitrophenyldiazonium. The best reproducibility was achieved in an aqueous-pyridine solution with the addition of a little ascorbic acid. The reaction product imparts a blue-violet color to the solution, as distinguished from the control solution which displays a pinkish-violet color. The maximum light absorption of the solution occurs at the wavelength of 575 mμ. The sensitivity is 1 microgram in the volume analyzed. In the concentration range of 1 to 10 micrograms there is a linear relationship between the optical density and the amine concentration in solution. No interference is caused by secondary and tertiary aliphatic amines or by aromatic amines. Any ammonia interferes with the determination, because its presence in the sample to the extent of 1 microgram colors the solution an intense blue-violet. The most selective reaction for the determination of secondary amines is based on the formation of copper dialkyldithiocarbamate. Where an air sample is taken in ethanol, and 0.1 ml of 15% alcohol solution of CS_2, 0.1 ml of 0.1% alcohol solution of copper acetate and 0.1 ml alcohol solution of NH_3 are added to the 3-ml sample. The addition of each reagent is followed by mixing of the solution. After 10 min, the intensity of the colored sample is compared against the standard scales, or else the optical density of the solution is measured in a cell. A method for the determination of trimethylamine in air using a citric acid solution in acetic anhydride was developed. Reactions with citric acid and acetic anhydride as well as those with phosphotungstic or phosphomolybdic acids may also be applied to studies of several tertiary amines, no interference being caused by secondary and (other) tertiary amines.##

09273

A. D. Babinsky and S. J. Doroszlaski

WATER AND CARBON REMOVAL FROM CARBON DIOXIDE REDUCTION SYSTEMS. TRW Inc., Cleveland, Ohio. Dept. of New Products. (Rept. Nos. ARML-TR-66-81 and NR-6453-5.) June 1966. 61 pp. (AFSWC, DDC: AD 643 594

Methods suitable for use in a weightless environment for removing water and carbon from carbon dioxide reduction process systems were investigated. Water removal studies were conducted using a porous metal, plate-type, condenser-separator to remove the water from the exit gas streams of both Sabatier and Bosch type carbon dioxide reduction reactors. Water remaining in the effluent stream ranged from 0.97 to 3.00 percent by volume with the Sabatier reactor, and 0.79 to 0.93 percent with the Bosch reactor. A regenerative chemical dryer used to increase the reaction rate of the Bosch reactor, resulted in relatively minor changes in the reaction rate in steady state operation. Carbon flow pattern tests were conducted to determine design characteristics of a carbon separator-filter. A combination centrifugal separator and porous metal filter was used to remove carbon from the recycle flow stream and seen approximately 99 percent of the carbon to the carbon collector. Periodic back flow through the filter removes the remaining carbon from the filter. The Bosch reactor utilizes flat iron catalyst plates attached on a hollow rotating shaft. Carbon is dislodged from the rotating plates by carbon removal fingers projecting between the catalyst

pistes. Reaction gases flowing through the reactor carry the carbon out of the reactor to the filter-separator. Filter clogging was observed due to continuance of the reaction in the filter element. Possibility of water separation and carbon removal were demonstrated. Recommendations are made to improve long term operation of the carbon filter element. (Author abstract)##

042851

B. J. Postosek

PHOTOCHEMISTRY OF HETEROCYCLIC COMPOUNDS (A LITERATURE SURVEY.)
Army Edgewood Arsenal, Md., Physical Research Lab.
(Rept. EASP 100-4.1 Sept. 1966. 35 pp.
DDC: AD 488-239

The literature on the photochemistry of heterocyclic compounds was surveyed with a particular interest in pyridine chemistry. This listing of references was compiled as a result of searching volumes 61 to 63 of Chemical Abstracts under the headings light, photochemistry, and pyridine.##

04288

P. Rudzitskas, H. H. Perris, and G. A. Reese

RESEARCH AND DEVELOPMENT STUDY RELATED TO THE SYNTHESIS OF FORMALDEHYDE FROM CO2 AND H2 (QUARTERLY PROGRESS REPT. NO. 2).
General American Transportation Corp., Niles, Ill.
General American Research Div. Jan. 1967. 13 pp.

This report summarizes the activities of the General American Research Division on the synthesis of formaldehyde. The activities during this quarter were concerned with (1) selection of solid catalysts and a correlation of their activities for the oxidation of methane to formaldehyde with their chemical and physical properties, (2) construction of an experimental system for methane oxidation to formaldehyde and the development of experimental procedures, and (3) testing solid catalysts and investigating the effects of variables such as temperature, feed gas composition, and space velocity on the yields of at concentrations below 20 ppm sulfur dioxide than would have been silica tube as the catalyst with a maximum formaldehyde yield ranging up to 0.7% of the methane in the feed gas.##

04289

P. Rudzitskas, H. H. Perris, and G. A. Reese

RESEARCH AND DEVELOPMENT STUDY RELATED TO THE SYNTHESIS OF FORMALDEHYDE FROM CO2 AND H2 (QUARTERLY PROGRESS REPT. NO. 1).
General American Transportation Corp., Niles, Ill.
General American Research Division, Oct. 1966. 32 pp.

This report summarizes the activities of the General American Research Division on the synthesis of formaldehyde. The activities during this period were concerned with (1) general

survey of the published abstracts of literature pertaining to the synthesis of formaldehyde (2) a review of methods for the synthesis of formaldehyde and their suitability for space applications (3) detailed literature survey on the oxidation of methane to formaldehyde.##

08518

D. C. Bradley and C. H. Harsh

MERCAPTIDES OF COBALT, NICKEL, COPPER AND ZINC (TECHNICAL REPT. NO. 5). University of Western Ontario, Canada, Dept. of Chemistry. May 17, 1966. 6 pp.

Studies were made on the chemistry of the mercaptides of cobalt, nickel, copper and zinc. The mercaptides were synthesized and their solubilities, thermal stabilities, magnetic properties, molecular weights, absorption spectra and polymer characterizations were investigated. Normal alkylmercaptans appeared to promote the formation of cobalt (III) mercaptides while isopropyl and tert-butylmercaptans formed bivalent (II) mercaptides. Nickel mercaptides were obtained as dark brown or black powders. $Ni(SR)_2$ was insoluble in common organic solvents but solubility in ether, carbon tetrachloride, n-hexane or cyclohexane of the higher mercaptides increased steadily with size of the alkyl group. Cuprous isopropylmercaptide and cuprous n-amylmercaptide were precipitated as pale yellow solids which were insoluble in common organic solvents and required nitric acid or hydrochloric acid and H_2S treatment to effect solution. Zinc isopropylmercaptide, zinc-n-amylmercaptide and zinc phenylmercaptide dimercaptate were obtained as white precipitates, the first two being insoluble in common organic solvents but dissolving in pyridine. The polymeric nature of the mercaptides is deduced from their solubility, volatility and other characteristics. In the case of the nickel mercaptides, it is probable that the soluble fractions contain mainly heteroatic species with the possible presence of pentamers and tetramers; the insoluble fraction may be a linear polymer.##

08569

T. Ohta and J. Lindenberg

PROPAGATORS FOR ALTERNANT HYDROCARBON MOLECULES. Phys. Rev. 139, (5A) A1061-8, Aug. 16, 1965.
Encl, AD-631 616

The possibility of a Green's-function formulation of the molecular many-electron problem was investigated. Green's function for electron and for particle-hole propagation was calculated for even alternant hydrocarbons. With the use of three parameters (gamma, beta and V, where gamma is the difference between the ionization potential and electron affinity for a carbon atom pi-electron when all interactions are present between atoms, or an estimated 10.0ev; and where gamma is the unit of energy and beta = 0.66 gamma = 6.6 ev is the appropriate value for the interatomic parameter) accurate correspondence between calculated and observed spectra for ethylene, benzene, naphthalene and anthracene was observed. (Author abstract modified)##

06656

A. A. Armstrong, Jr. and W. R. Walsh

RADIATION-INDUCED OXIDATION OF HYDROCARBONS. North Carolina State Univ., Raleigh. Dept. of Textile Chemistry. (Rept. No. ORO-638.) July 15, 1965. 40 pp.
CFSTI, ORO-638

The radiation-induced oxidation of ethane, propane and isobutane was studied in a flow-type reactor using hydrogen bromide as a catalyst. A cobalt-60 source (Gammacell 220) was used for the irradiation. The exposure dose rate inside the reactor was approximately 100000 r./hr. In the oxidation of ethane, a G-value of 800 was obtained for the production of acetic acid. An increase in total flow rate of ethane to the reactor increased the production rate of acetic acid. The most pronounced effect was noted from an increase in pressure. An increase in the rate of production of acetic acid of 8 times was obtained by increasing the total pressure from 1 to 4 ata. In the oxidation of propane, a G-value of 10,000 was obtained for the production of acetone. Increases in total flow rate did not affect the rate of production. An increase in total pressure up to 3 ata. increased the rate of production of acetone but decreased the rate above that. At 4 ata., corrosion products were deposited on the reactor surface which accounted for the decrease in the rate of production of acetone. In the oxidation of isobutane, the products were t-butyl bromide, methyl bromide and water. The expected products of t-butyl hydroperoxide and di-t-butyl peroxide as reported by other investigators were not present. The radiation-induced oxidation of propane to acetone was the only reaction studied that gave a G-value high enough to look promising. Although the radiation-induced oxidation of propane to acetone looked attractive from the standpoint of radiation yield, it now is impractical from an economic viewpoint. (Author abstract)GS

06656

S. D. Doepker and P. Ausloos

PHOTOLYSIS OF CYCLOBUTANE AT PHOTON ENERGIES BELOW AND ABOVE THE IONIZATION ENERGY. J. Chem. Phys. 43 (11) 3814-9, Dec. 1, 1965.

The photolysis of cyclo-C4H8 and of cyclo-C4H8-cyclo-C4D8 mixtures was investigated at 1470 and 1236A in the absence and presence of NO. In addition, a series of experiments carried out in which NO was used as a free-radical interceptor in the photolysis of cyclo-C4D8 at 1236 A. Approximately 80% of the observed products can be accounted for by the primary process: C4H8+hv yields 2C2H4. The extent to which the internally excited ethylene formed in this process will decompose further increases with diminishing pressure and wavelength. The photolysis of cyclobutane was investigated at energies above the ionization energy (I.E.=10.3ev), using the argon resonance lines at 11.83 and 11.72 ev. It is shown that when NO is added to the system, cis-2-butene, trans-2-butene, and 1-butene are major products. These butenes are, however, not produced when NO (E.E.=9.25 ev) is replaced by O2 (I.E.=12.1 ev) and are only formed in trace amounts when no additives are present. It is suggested that the parent ion acquires the olefinic structure and undergoes charge exchange with NO. (Author abstract)GS

08483

E. L. Wong A. H. Potter, Jr.

MASS-SPECTROMETRIC INVESTIGATION OF REACTION OF OXYGEN ATOMS WITH METHANE. National Aeronautics and Space Administration Cleveland, Ohio, Lewis Research Center (Dept. NASA TN D-3171.) Apr. 1966. 15 pp.

A mass-spectrometric stirred-reactor technique was used to study the reaction of atomic oxygen with methane with low concentrations of molecular oxygen. Low concentrations of molecular oxygen were used to suppress the reactions O + O2 + M yields O3 + M and H + O2 + M yields HO2 + M. An overall rate constant for oxygen-atom disappearance due to added methane was obtained for the temperature range of 375 to 575 K. This rate constant was 9.2x10 to the 13th power exp (-10 300/RT) and was compared with the previous rate constant for this reaction in the presence of a large excess of molecular oxygen. This comparison showed that the presence of an excess of molecular oxygen increased the oxygen-atom consumption only for the lower temperatures. Product analyses indicated that the stoichiometry of the reaction could be represented by: CH4 + 4.09 O yields 0.91 CO + 1.00 O2 + 0.95 H2 + 1.00 H2O +0.09 CO2 + 0.10 H. On the basis of product analyses, a reaction mechanism was proposed. From this reaction mechanism and the reaction stoichiometry the rate of the initial elementary reaction CH4 + O yields CH3 + OH was estimated to be about one-fourth of the overall rate for oxygen atom disappearance, or about 9x10 to the 13th power exp (-10 000/RT.) (Author summary)##

08550

P. P. Boniforth

METHODS FOR ESTIMATING OXIDES OF NITROGEN EMISSIONS FROM COMBUSTION PROCESSES. Am. Ind. Hyg. Assoc. J. 22, 481-8, Dec. 1961. (Presented at the 22nd Annual Meeting, American Industrial Hygiene Association, Detroit, Mich., Apr. 1961.)

Methods for estimating emissions of oxides of nitrogen from combustion processes were developed. Nitrogen oxide formation is related to temperature or heat supplied in the combustion process; and temperature or heat supplied is related to exhaust gas values as a function of per cent CO2 in the exhaust gas. The formation of nitrogen oxides is related to fuel consumption by a power function which is linear on a log-log plot. Equations and nomographs were derived by means of which the pounds of nitrogen oxides per hour emitted from a combustion process may be estimated. Using these values as intercepts on the logarithmic plot of emission of oxides of nitrogen in pounds per hour versus fuel heat input in Btu/hr and the reciprocal slope of 1.18 previously developed, the mathematical relationship between heat input and NOx emission is lbs NOx/hr = Btu/hr over 0.000088 exp 1.18; lbs NOx/hr = Btu/hr over 0.0000848 exp 1.18. Where Btu/hr = total heat input from fuel per hour.##

05583

J. Hutchison, and H. S. Johnston

PHOTOCHEMICAL OXIDATIONS. II. METHYL IODIDE. J. Am. Chem. Soc. 83, 4030-9, 1962.

The room-temperature photo-oxidation of methyl iodide (0.2 to 1.0 mm.) in oxygen (0.010 to 10 mm.) with continuous UV radiation above 2200 A. was studied. Observations were made by leading the reaction mixture directly into the electron beam of the mass spectrometer during photolysis. The principal products of reaction were I_2, H_2O, CH_3OH and under some conditions CH_3OOH; minor products were H_2O, CO_2, $HCOOH$, CH_3OOCH_3 and CH_3I. Because of the cracking patterns of the reactants and major products and the background air peaks, it was impossible to establish the presence or absence of CH_4, CO and H_2. There are conflicting claims in the literature as to whether methyl radicals react with oxygen according to $CH_3 + O_2 (+ M) \rightarrow CH_3O_2 (+ M)$ (followed by the Vaughn mechanism) or $CH_3 + O_2 \rightarrow H_2CO + HO$ (followed by HO attack on loosely bound hydrogen atoms). This study indicates both processes do occur, with the first being more important under conditions used here. It seems probable that oxygen molecules abstract hydrogen atoms from CH_3O radicals to produce H_2CO and HO_2. A fairly complete and internally consistent mechanism is developed for the initial reaction, typically the reaction of about 0.0001 or 0.001 of the methyl iodide. As the reaction progresses, inhibition caused by $CH_3 + I_2$ equals $CH_3I + I$ becomes very pronounced, radicals abstract from H_2CO, a large number of other secondary reactions seem to occur, and the mechanism proposed is regarded as exemplary rather than established. In terms of the relatively simple initial reaction, many ratios of constants are evaluated. (Author abstract)00

04617

L. G. Caretto and K. Hohn

CATALYTIC COMBUSTION OF CYCLOHEXANE, CYCLOHEXENE, AND BENZENE (CHEMICAL AND TRANSPORT KINETICS). Ind. Eng. Chem. Process Design Develop. 5, (3) 217-22, July 1966. (Presented before the Division of Petroleum Chemistry, 149th Meeting, American Chemical Society, Detroit, Mich., Apr. 1965.)

The oxidation of benzene, cyclohexane, and cyclohexene in low concentrations over a fixed bed of copper oxide-alumina (1 to 1) catalyst was found to follow the simple rate expression, rate = kp to the 1/2 power, where k follows the Arrhenius temperature dependence at low temperatures. Deviations at high temperatures led to an investigation of pore diffusion effects, which were analyzed by a computer calculation using finite difference equations and considering the effectiveness factor to be a function of concentration. This functionality is indicated graphically, where effectiveness factor is plotted as a function of bed position. The apparent diffusivity ratio necessary to give good agreement between calculated and experimental exit conversions ranged from 0.7 to 1.6, compared with an expected value of 0.26. One possible explanation for these large diffusivity

tation to surface diffusion. Quantitative considerations of surface diffusion showed that large diffusivity ratios could be explained by a surface diffusion contribution of 1.7 to 5.7 times as much as the gas phase diffusion in the pores. (Author conclusions)##

05653

P. A. Leighton

SOME REMARKS ON THE NITRIC OXIDE -- NITROGEN DIOXIDE conversion. Preprint. (Presented at the Air Pollution Research Conference on "Atmospheric Reactions," Univ. of Southern California, Los Angeles, Calif., Dec. 5, 1961.)

Nitric oxide-nitrogen dioxide photochemical conversion theory is reviewed. It has been almost universally postulated that the products of oxygen-olefin and possibly ozone-olefin reactions, which promote the above mentioned conversion, are free radicals. The extent to which these reactions produce radicals and the nature of the radicals produced in air have not been established. Other unresolved questions pertaining to this conversion reaction involve reaction kinetics and reactant concentrations.##

04653

J. M. Singer, E. D. Cook, H. F. Harris, V. H. Rowe, J. Grumer

FLAME CHARACTERISTICS CAUSING AIR POLLUTION; PRODUCTION OF OXIDES OF NITROGEN AND CARBON MONOXIDE. Bureau of Mines, Pittsburgh, Pa. (Presented at the Symposium on Combustion Reactions of Fossil Fuels, 153rd National Meeting, American Chemical Society, New York City, Sept. 11-6, 1966 and at the Basic Research Symposium, Chicago, Ill., Mar. 14, 1967.) 40 pp.

Concentrations of nitrogen oxides and carbon monoxide in combustion gases of lean, stoichiometric, and rich propane-air flames are predicted from theoretical kinetic and thermodynamic calculations. Experimental values are higher than the theoretical by factors of 2 to 7. Lowering the primary flame temperature with cold flue gas reduces the nitric oxide and increases the carbon monoxide concentrations. Cooling rates of 5500 degrees to 10,000 degrees R/sec starting at about 3500 degrees R maintain the nitric oxide in the primary combustion zone at the initial value and do not prevent oxidation of the carbon monoxide.##

04668

M. L. Slater R. R. Dills

PARTIAL COMBUSTION OF RESIDUAL FUELS. Chem. Eng. Progr. 61, (11) 85-8, Nov. 1965.

Partial oxidation of residual fuel oils produces high purity synthesis gas containing hydrogen, carbon monoxide, carbon dioxide, methane, and only minor traces of impurities. The methane concentration in the synthesis gas produced at elevated pressures corresponds to equilibrium conditions. Although the studies of the process have been made at pressures up to 1,500 lb/sq in gauge, there have been no indications that this pressure can not be increased several fold. The soot produced from heavy oils is water-wettable, has oil absorption numbers of 150 to 500 lb/100 lb, and has specific surface areas of 100 to 1,300 sq m/g. The oil absorption number of the soot increases directly with the steam/oil ratio in the feed to the synthesis gas generator. (Author conclusions)##

00926

R. G. Salooja

INFLUENCE OF POTASSIUM CHLORIDE ON COMBUSTION PROCESSES LEADING TO IGNITION. Combust. Flame 10, (1) 45-9, Mar., 1966.

Combustion studies were carried out on the following hydrocarbons: pentane, hexane, 2-methylpentane, 2,2-dimethylbutane, iso-octane, cyclohexane and methylcyclohexane. The oxygenated compounds studied included acetic acid, methyl formate, propionic acid, ethyl formate, methyl acetate, acetaldehyde, acetone, diethyl ether, isopropanol and methanol. Results are reported for only one of the hydrocarbons studied, namely pentane, because the behavior of different hydrocarbons was generally similar. KCl markedly inhibited the oxidation process at all stages leading to ignition. In marked contrast to its effect on hydrocarbons, KCl promoted the pre-flame oxidation of acetic acid, propionic acid, methyl formate, ethyl formate, methyl acetate and acetone. It markedly inhibited the combustion of methanol and isopropanol. The effect of KCl on the ignition of acetic acid and acetone was not studied since these compounds ignite well above 600 C, but with propionic acid and the esters studied KCl strongly inhibited the onset of ignition despite its promoting effect on their pre-flame oxidation. The promoting effect on the oxidation of carbonyl compounds, particularly the lowering of the temperature at which oxidation commences, suggests a direct reaction between KCl and carbonyl compounds. Another observation is that, in contrast to the behavior in the clean vessel, KCl generally causes more CO2 to form than CO. Under the experimental conditions, KCl does not significantly catalyse the combustion of CO to CO2. Therefore, the greater formation of CO2 must arise from attachment of oxygen to the carbonyl progenitor of CO. The inhibiting effect of KCl on the combustion of hydrocarbons would seem to arise primarily from its effect on HO2 radicals formed prior to the appearance of carbonyl intermediates. The absence of any H2O2 in the products in KCl-coated vessels supports this view.##

04992

A. J. Haagen-Smit, C. E. Bradley, M. M. Fox

FORMATION OF OZONE IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 54-6.

When dust pieces of rubber were exposed to sunlight in the presence of oxygen and nitrogen dioxide no cracking took place. Rubber cracked in nitrogen dioxide in air but not when the air was filtered through charcoal. Rubber cracked in 3-methylheptane and NO2 in air but not when either was used alone; it cracked when introduced to a mixture exposed to sunlight for several hours. Ozone was identified as the rubber-cracking material. Rubber cracked in some organic acids photooxidized with NO2 in air; ozone was again isolated and identified. Rubber cracked in gasoline photooxidized with NO2 in air. Ozone formed when 3-n-hexene was photooxidized with NO2 in air. Diacetyl in air cracked rubber when exposed to sunlight; ozone was identified. Rubber also cracked with diacetyl and NO2 in air. Rubber cracked in butyl nitrite in air exposed to sunlight. The concentrations of the organic materials and of NO2 were of the same order as those found in Los Angeles smog.##

05084

I. R. King

RECOMBINATION OF IONS IN FLAMES EFFECT OF TEMPERATURE. Texaco Experiment Inc., Richmond, Va. (Rept. Nos. APGRD-463, PP-165A, and NRD 2789) Aug. 1, 1961. 5 pp.

The effect of temperature on the recombination rate of ions in a hydrocarbon-air flame is presented and the results compared with predictions based on present-day theories. Measurements were conducted with an alternate-probe technique in a propane-air flame burning on a Meker-type burner 5.5 cm in diameter. Two probes of different length, mounted at right angles to each other on a common shaft (the two probes being in a plane perpendicular to the shaft), entered the flame from the side, parallel to the flame front. By measuring current first with one probe, then with the other, and subtracting the two readings, it was possible to determine the ion concentration in the center of the flame. An ion-ion process agreeing with the Langevin prediction is indicated.##

05085

H. B. Bhattacharjee, R. B. James, W. S. Husmann, H. Eyring, and T. Ree

STUDIES TO DETERMINE THE MECHANISM OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES. (Utah Univ., Salt Lake City.) (Dept. No. APGRD-TR61-1 Aug. 8, 1961 37 pp.

Probable chain reactions and mechanism for the formation of the most abundant positive ions are suggested. A steady state analysis of reactions reveals a number of important conditions that must be fulfilled for the most abundant ion formation. Approximate values for the maximum and minimum concentrations of the most abundant ion with respect to oxygen are obtained. A semi-theoretical method is used to calculate the concentration of the most abundant ion in hydrocarbon-oxygen or hydrocarbon-air flames. Experimental studies have been performed on the effect

of ultra-violet light on ion concentrations in flames. Research has also been started on the effect of the degree of unsaturation, state of oxidation, and length of the carbon chain on ionization of various hydrocarbons in a hydrogen-oxygen flame.

05051

B. S. Rabinovitch, and D. W. Setser

UNIMOLECULAR DECOMPOSITION AND SOME ISOTOPE EFFECTS OF SIMPLE ALKANES AND ALKYL RADICALS. Washington Univ., Seattle, Dept. of Chemistry and Kansas State Univ., Manhattan, Dept. of Chemistry, June 1, 1964. 182 pp.

A theoretical study is reported on the nature of unimolecular reactions, their dependence on the energy parameters of the systems involved (photo-chemical or thermal), and their dependence on molecular structure. The relevant aspects of the RRKM formulation for unimolecular reactions are discussed. Emphasis is placed upon the present status of the theory, and the best techniques for carrying out computations. Characterization of various model hydrocarbon-type molecular species which are used in theoretical calculations are outlined. Kinetic isotope effects are considered and model calculations presented for hydrogen-deuterium substitution. Consideration of reaction processes shows that a given hydrocarbon species can be produced at many different pressures, in a variety of energy states and with various hydrogen-deuterium isotopic compositions. Specific rate constant relationships to experimental parameter are discussed. The behavior of some C(1)-C(5) alkanes and alkyl radicals are calculated as examples of highly important practical systems. It is hoped this will provide useful insights into experimental situations.##

05056

D. E. Van Sickle and R. R. Hays

OXIDATION OF UNSATURATED HYDROCARBONS (FINAL REPT. OCT. 1, 1961-SEPT. 30, 1963). Stanford Research Inst., Menlo Park, Calif. Jan. 10, 1964. 8 pp.

Research effort for the last two years was directed principally toward product studies of low temperature, liquid-phase olefin oxidations. Pure hydrocarbons were utilized where possible, azo initiators employed, and conversions limited to 5%. Correlation of the hydroperoxides produced with the remaining products found and assignment of relative rates for two chain propagation reactions were attempted. A secondary effort was the study of autocatalysis in oxidation. Cyclopentene was chosen as a model compound, since its oxidation mechanism is the simplest of the olefins studied. Decomposition and initiating properties of hydroperoxides also received attention. (Author introduction modified)##

05100

J. N. Pitts, Jr., H. W. Johnson, and T. Kuwana

STRUCTURAL EFFECTS IN THE PHOTOCHEMICAL PROCESSES OF KETONES IN SOLUTION. J. Phys. Chem. 66, 2456-61 (Dec. 1962). (Presented at the Symposium on Reversible Photochemistry Process, Durham, N.C., Apr. 1962.)

The primary objective of this investigation was to check the effect of substituent groups and location of substitution on the photoreduction of a series of benzophenone derivatives. The behavior of a series of hydroxy, methoxy, amino, and chlorobenzophenones in the photopinacol reaction was studied using product isolation, UV spectroscopy, phosphorescence, fluorescence, and EPR spectroscopy. Results and correlations derived from these studies are discussed herein. Some of these include the following: Ortho substitution by a number of functional groups has a pronounced effect on the "go - no go" photoproperties of the benzophenone derivatives. Replacing the OH or the CH3 by methoxy or carboxy restored the intermolecular hydrogen atom abstracting power of the benzophenone. This suggests that the deactivating effect of o-OH, NH2, NHCH3, and methyl groups is due to their tendency to form reversible photoenols. Ten and 24-hour irradiation at room temperature of degassed 0.01 M solutions of p-aminobenzophenone in isopropyl alcohol using a medium intensity mercury lamp produced no significant permanent changes. Strong phosphorescence was noted during irradiation in the rigid medium at 77 K., and EPR resonance signal due to the triplet state of 4-aminobenzophenone was observed. Long-lived phosphorescence was also observed for p-dimethylaminobenzophenone and p,p'-bis(dimethylamino) benzophenone. EPR studies of these and other para-substituted compounds are in progress. A preliminary report on a similar study in the anthraquinone system is included.##

05208L

T. J. Wallace, and H. Friedman

FUNDAMENTAL INVESTIGATIONS OF THE CATALYTIC DEGRADATION OF HYDROCARBON FUELS (FIRST QUARTERLY PROGRESS REPT., FEB. 16-MAY 16, 1962.) ESSO Research and Engineering Co., Linden, N. J., Process Research Div. May 16, 1962. 10 pp. (Rept. No. 1):

The reactivity of dilute solutions of benzaldehyde phenyl hydrazone (BPH) and tolyl phenyl hydrazone (TPH) in benzene toward molecular oxygen has been determined at 25 to 30 C. and one atmosphere pressure of oxygen. Both hydrazones oxidized readily under these conditions with TPH being more reactive than BPH. This reactivity difference is probably due to the electron-donating capabilities of the methyl group. It suggests that electron-attracting groups will decrease the reactivity of the initial hydrazone but accelerate the decomposition of the peroxide which is formed. The stoichiometry of the above reactions was determined. Each mole of oxygen consumed reacts with one mole of hydrazone to produce one mole of peroxide. The disappearance of the hydrazone is best represented by a pseudo

first order kinetic plot. Good reproducibility of the rate constants was observed. The rate-determining step is, most likely, hydrogen atom and ozone in benzene at 25 to 50 C. About 5 to 10% oxidation of each hydrocarbon was observed under these said conditions. In the absence of NPH, no oxidation of indene was observed over a 72 hour period. Infrared data show that indene is converted to products which contain a carbonyl linkage. To date, attempts to oxidize tetralin have been unsuccessful. (Author abstract)

05326

E. Fecht, and P. A. Back

THE REACTION OF ACTIVE NITROGEN WITH MIXTURES OF ETHYLENE AND NITRIC OXIDE. Can. J. Chem. 43, 1000-004, 1965. (Presented at the Annual Conference, Chemical Inst. of Canada, Kingston, June 1964, N.R.C. No. 8806.)

The reaction of active nitrogen, produced in a condensed discharge at 1 mm pressure, with mixtures of ethylene and nitric oxide has been studied with mixtures ranging in composition from pure ethylene to pure nitric oxide. The sum of HCN + 1/2NH3 produced from mixtures of C2H4 and 1%NO remained constant and equal to the HCN produced from pure C2H4 for NO concentrations up to 50 mole %. As more NO was added, this sum rose towards the value of 1/2NH3 produced from pure 1%NO. These data appear to lend support to the HCN yield from ethylene as the true measure of nitrogen atom concentration. It is suggested that 1%NO also undergoes a concerted reaction with excited 1S2S1 molecules, to produce 1/2N2, and that these excited molecules can quenched by collision with ethylene or methane without consuming nitrogen or forming HCN. (Author abstract)

05325

Long, R.

FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS DURING INCOMPLETE COMBUSTION. (Progress Rept. Oct. 1, 1964-Mar. 31, 1965). Birmingham Univ., England. (Mar. 1965): 17 pp.

This report comprises three parts: Part I: discusses the development of a rapid analytical method for polycyclic aromatic hydrocarbons in soots. Extraction with CHCl3 was followed by column chromatography and then by programmed temperature gas chromatography, with UV spectrophotometry. Certain polycyclic aromatics thus identified, have not been reported hitherto in the literature on soots from hydrocarbon flames. Investigations were made on diffusion flames in which various concentrations of O2 in O2-N2 and O2-Ar mixtures as oxidant were used. In other experiments oxygen and other additives were introduced into the fuel supply. The effects on the formation of total soot, carbonaceous residue, CHCl3 soluble material and polycyclic aromatics are discussed. Part II: An investigation was made of the concentrations of stable species in the pyrolysis zone and particularly in the luminous zone of propane and ethylene diffusion flames burning on a Wolfhard-Parker type of burner. The effects of

O2, H2 and CH2 as additives to the fuel and of O2 and H2 to the air stream were examined. Results showed that the sooting rate is related to the CH2 present in the luminous zone for the CH2 flames. Part III: An investigation was made of the polycyclic aromatic hydrocarbons associated with the soot in pre-mixed C2H2-O2 flames operating at 20 mm. Hg. On the assumption that the concentration of polycyclic aromatics in the soots collected at increasing heights in the flame represents the state of affairs in the flame, it appears that the polycyclic aromatics are formed principally in a lower temperature region of the flame than that corresponding to "carbon" formation. Results also indicate that CH2 is important in carbon formation in C2H2 and C2H2-air diffusion flames. (Author summary modified)

05443

Purcell, T. C. and I. R. Cohen

PHOTO-OXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC KETONES. Atmos. Environ., 1(6):609-623, Nov. 1967. 16 refs.

Products of photooxidation reactions involving ketone-hydrocarbon mixtures are reported. Reaction mixtures were prepared in plastic bags fabricated from fluorinated ethylene-propylene plastics. The containers were irradiated by fluorescent lamps with intensity maximum at 3100 A. The ketones and/or hydrocarbon mixtures consisted of: acetone, acetone-3-methyl-1-butene, and diethyl ketone. The percentage conversions, after 1, 2, and 3 hours of irradiation, of 3-methyl-butene-1 and acetone as a function of ratio of ketone to olefin showed that the acetone conversion is essentially constant, whereas olefin conversions increase with increasing ratio. Extrapolation of zero ratios of ketone to olefin indicates an inexplainable background reaction at longer conversion times. As with the aldehyde-olefin systems, the rate of consumption of olefin increased at longer reaction times. The ketone conversion rates are virtually constant. Peak oxidants such as ozone or peroxy acid were not detected. Alkyl hydroperoxide was identified as a slow oxidant product. The portion of these products due to the ketone photooxidation and that due to the olefin has not yet been determined. A mechanism often cited to explain the photooxidation of ketones involves a free-radical scheme.##

05395

H. Long and E. E. Tompkins

FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN PRE-MIXED ACETYLENE-OXYGEN FLAMES. Nature 213 (5080), 1011-2 (Mar. 11, 1967).

An investigation is reported of the polycyclic aromatic hydrocarbons associated with the soot in pre-mixed acetylene-oxygen flames operating at a pressure of 20 mm of Hg. At the specified pressure, an acetylene-oxygen ratio of about 0.95 just began to produce soot. The flame corresponded to acetylene-oxygen ratios of 1 to 2 and 1 to 5. The apparent temperatures (uncorrected) were recorded at varying heights and the results are plotted for flame 1. Soot was removed from the collecting grid,

extracted, and the extract dissolved in CS2. Analyses were carried out by chromatographic techniques and thermal conductivity. Results showed that between heights of 1 and about 5 in. in the flame there is a gradual increase in the concentration of polycyclic aromatic hydrocarbons in the soot but a considerably greater increase occurs later in the flame at heights of 6-10 in. above the burner, indicating that the concentration of polycyclic aromatic hydrocarbons in the soot reflects the state of affairs in the flame. The formation of polycyclic aromatic hydrocarbons appears to occur principally in a lower temperature region of the flame than that corresponding to soot formation. Of the polycyclic aromatic hydrocarbons, pyrene occurs in the greatest concentration in the soot up to approximately 7 in. above the burner after which 3,4-benzopyrene predominates. (Although the gas chromatographic peak represented chrysene and 1,2-benzanthracene unresolved, spectrophotometry of this fraction indicated only a small proportion of the former.) The relative concentrations of individual hydrocarbons change with height above the burner, formation of higher condensed ring systems by the pyrolysis of relatively low molecular weight polycyclic aromatic hydrocarbons has been established and such processes in this study appeared to be occurring in the flame.##

05923

Benson, S. W. and G. B. Haugen

THE MECHANISM OF THE HIGH-TEMPERATURE REACTIONS BETWEEN CH3I AND HYDROGEN. J. Phys. Chem., 71(13):4404-4411, Dec. 1967. 20 refs.

The observed high-temperature rates of isotope exchange between CH3I and D2 have been interpreted in terms of a radical mechanism. The chain propagation steps for the system are D + CH3I yields CH3D + I and H + D2 yields D + HD. The lower temperature addition kinetics to form CH3I are fitted very well by a related chain with the same initiation and termination but a different propagation. The theoretical steady- state rate expression, derived from the radical mechanism, adequately predicts the observed rates at temperatures greater than 1400 deg K. The problem of attainment of steady state during the short time interval of the experiment and the catalytic effect of traces of oxygen and organic impurities on the induction period are discussed. (Authors' abstract, modified)##

05925

Shaw, R.; F. W. Cruickshank, and S. W. Benson

THE REACTION OF NITRIC OXIDE WITH 1,3- AND 1,4-CYCLOHEXADIENES. J. Phys. Chem., 71(13):4538-4543 Dec. 1967. 16 refs.

The gas-phase reactions of nitric oxide with 1,3- and 1,4-cyclohexadiene have been studied in a Pyrex reaction vessel between 305 and 359 deg. Initial pressures were varied: 1,3-CH, 3-57 torr; 1,4-CH, 10-71 torr; and NO, 69-436 torr. No pressure change could be detected. Products identified by gas chromatography and mass spectrometry were water, nitrous oxide,

benzene, and traces (about 10% of the benzene) of cyclohexene. Good mass balances were obtained for the hydrocarbons, but the water analyses were erratic and the nitrous oxide was less than given by the stoichiometric equation. The rate of production of benzene was unaffected by increasing the surface to volume ratio 20 times and the first step is cyclohexadiene and nitric oxide. The rate-determining step is given. (Authors' abstract, modified)##

05868

B. Gelius and B. Franke

AN INVESTIGATION OF THE COMBUSTION PRODUCTS OF ALKYL-LEAD COMPOUNDS. (Untersuchungen der Verbrennungsprodukte von Alkylbleiverbindungen.) Kraftstoff-Chem. Rdsch. 17(9) 268-9, Sept. 1980. Ger.

Tetramethyl-, tetraethyl-, and tetra-n-propyl lead were burned in air in the presence of n-heptane, isooctane, or benzene. The combustion products were collected on the surface of a cooled glass tube, in a glass wool filter, and in an electrofilter. In order to eliminate the formation of nitrites, the nitrogen in the air could be replaced by argon. The combustion of the alkyl lead compounds takes place as follows: the compounds thermolyze when the combustible mixture approaches the hot regions of the flame. The result is a smoke of fine PbO particles. The combustion residues are then almost identical to those from the alkyl lead mixture. In the third zone, behind the flame, PbO(s)-Pb(l), PbO(l)-Pb(g), PbO2 (as Pb3O4, etc. 0.1-3%), and Pb(SO4) is formed. In internal combustion engines the effectiveness of PbO as an antiknock agent lasts about 1 millisecond. These experiments suggest that the surfaces of the PbO particles may convert to Pb(SO4), thereby rendering the antiknock additive ineffective.##

05811

S. W. Nichols, J. Haskins, and H. A. Price

A RADIOTRACER STUDY OF THE PRODUCTION OF FORMALDEHYDE IN THE PHOTO-OXIDATION OF ETHYLENE IN THE ATMOSPHERE (PART I.--THE EFFECT OF OTHER COMPOUNDS ON YIELD AND CONVERSION). J. Air Pollution Control Assoc. 19, (6) 379-8, June 1969.

In this study, the tracer procedure was used to study some aspects of the effect of composition of the irradiated mixture on the amount of formaldehyde produced from ethylene, the latter being the dominant olefin in auto exhaust. The irradiation chamber contained oxidants, NO2, CH2O, hydrocarbons and aerosols. Oxidant, nitrogen dioxide, and aerosols were measured in order to obtain a more complete monitoring record of the reaction. Chemical formaldehyde and radiochemical formaldehyde measurements together with gas chromatographic determination of hydrocarbons, were used to establish yields and conversion. Results showed: (1) Ethylene gives more formaldehyde in the presence of oxygenates and certain aromatics because the reactions are faster; the fraction converted, however, remains constant. The quantitative aspects of the effect of oxygenates remain to be studied. (2)

Formaldehyde yield from ethylene irradiated alone depends on the nitric oxide-hydrocarbon ratio. (3) In the presence of other olefins, the nitric oxide dependency is much less. (4) Production of formaldehyde from ethylene is not influenced by other olefins except for the nitric oxide effect. In reference to changing composition of exhaust, oxygenates can be expected to increase formaldehyde formed during photo-oxidations, but it is not yet possible to state how big the effect might be. The removal of olefins will probably affect formaldehyde production in proportion to the extent of removal. Removal of other olefins will not affect the reactions of ethylene per se except for the nitric oxide-hydrocarbon ratio effect.##

05613

Levine, S., W. F. Hamilton, and R. Simon

ATMOSPHERIC PHOTOCHEMICAL REACTIONS OF HALOGENS AND BUTYL HALIDES. J. Air Pollution Control Assoc., 16(6):330-333, June 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., June 9-13, 1965.)

This investigation was oriented toward delineation of the interactions involved in the chemical inhibition of smog exhibited by iodine and to a much lesser extent by the other halogens. Apparatus used for handling and irradiating polluted atmospheric air was a 500 cu ft chamber enclosed by a "Mylar" polyester film 1 mil thick. The chamber is mounted on large casters allowing positioning of the unit for optimum sunlight exposure. When thermal (dark) reactions are studied, the entire chamber is rolled into a large, light tight, thermostatically controlled oven. Other details concerning the laboratory procedure are given. The results of these tests show that neither temperature, over the range of about 100 to 300 F, nor sunlight greatly influences the reaction rate of O3 with iodine 2, and that sunlight has a much greater effect on the reaction rates of the halogens with O3 than does temperature. The qualitative rates of halogen-ozone reactions in purified air in sunlight are iodine 2 greater than Br2 greater than Cl2. The effectiveness of iodine 2 in reducing O3 in a smoggy atmosphere is enhanced over its effect on O3 in purified air, whereas the effectiveness of Br2 and Cl2 in quenching smog O3 is diminished. The effectiveness of Br2 in reducing O3 is inhibited by the presence of both saturated and unsaturated hydrocarbons, whereas the iodine 2 - O3 reaction is unaffected.##

05631

H. H. Peaser

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. Preprint, 1966.

During the period covered by this report, primary effort was in the investigation of the effect of the fuel employed upon the characteristic perturbations and the residual quantities of the oxides of nitrogen. The experimental conditions encountered in connection with the investigation of the behavior of the

propane-air and the n-butane-air system are given. The average reaction pressure was approximately 47 p.s.i.a. The composition of the products of reaction for the ethane-air, propane-air, n-butane-air and natural gas-air systems are tabulated. All the measurements involving natural gas-air, ethane-air, propane-air and n-butane-air, were carried out at a stoichiometric mixture ratio of approximately 0.95. Variation in the perturbations of normal stress and the frequency, as a function of the molecular weight of the fuel are reported. The quantities of residual oxides of nitrogen increased rapidly with an increase in molecular wt. from that of the natural gas-air system to that of the ethane-air system and progressively increased with further increases in molecular wt. to propane and n-butane. On the other hand, the perturbations in the double amplitude of the normal stress decreased progressively with an increase in molecular wt. of the fuel. Phase relationships between the upper and lower ports were almost exactly 180 degrees. The frequency was approximately 509 cycles per sec in the case of the natural gas-air system. An increase to 521 cycles per sec was found for the ethane-air system and a small decrease to 518 and 516 cycles per sec for the propane-air and the n-butane-air systems respectively was observed. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is included. It is apparent, as in the case of the ethane-air system, that a phase relationship slightly greater than 180 degrees exists between the upper and lower ports, again confirming that the primary nature of the perturbations involved a longitudinal wave.##

05839

L. G. Wayne

ON THE MECHANISM OF PHOTO-OXIDATION IN SMOG. Preprint. (Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles,

The action of sunlight on urban atmospheres contaminated with auto exhausts promotes oxidation of hydrocarbons and NO and eventual accumulation of O_3. Some very intriguing problems of chemical mechanisms are presented by these reactions. It is the purpose of this paper to subject to an elementary kinetic analysis some of the proposed reaction schemes and to introduce a mechanism which shows promise of explaining certain features of the photooxidation process. Experiments have established that the oxidant material in mainly O_3. The various hydrocarbons present in automobile exhaust disappear at different rates; olefins in general react more rapidly than paraffins, and most olefins react more rapidly than ethylene, which is the predominant olefin in auto exhaust. Relevant information available from experiments involving the irradiation of synthetic atmospheres containing low concentrations of hydrocarbons and oxides of nitrogen has presented reasoning leading to the conclusion that react chains are very probably involved in these systems. Briefly, the reasoning is that, since NO_2 is the only likely primary absorber of actinic light products, hydrocarbons are probably involved by reaction with the oxygen atoms produced in the photolysis of NO_2; but since the rate of accumulation of products is sometimes faster than the estimated rate of reaction between hydrocarbon molecules and oxygen atoms, each appropriate oxygen atom collision must lead to several subsequent steps, i.e., to a chain of reactions. Such a chain might promote the conversion of NO to NO_2 in either of two ways: by direct consumption of NO, or by consumption of molecular oxygen to form O_3. Kinetic implications of chain mechanisms of 3 different types are examined: (1) A mechanism offered by Haagen, in which chains are initiated by free

radicals formed in a hydrogen abstraction reaction by oxygen atoms; (2) A scheme suggested by Leighton incorporating some suggestion of Schuck and Doyle; (3) A new hypothetical mechanism, serving to illustrate the possible consequences of a chain-branching step. Further study, particularly of the relative rates of photooxidation of nitric oxide and olefins in systems with very little nitrogen dioxide, should provide evidence bearing on the importance of branching chains in the urban photochemical smog system.##

05849

M. A. Rensetti and G. J. Doyle

THE CHEMICAL NATURE OF THE PARTICULATE IN IRRADIATED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 8 (4), 293-6 (Feb. 1959).

The Los Angeles smog is characterized by its several manifestations namely, eye irritation, crop damage, reduced visibility, and high ozone concentrations. Since automobile exhaust is the major contributor to the pollution of the Los Angeles atmosphere, its relation to all aspects of smog formation is of prime importance. There have been three studies of the chemical nature of the particulate in non-irradiated auto exhaust. This is believed to be the first report on the nature of photochemically generated aerosol in auto exhaust. All of the aerosol collected for the chemical analyses was generated under similar conditions. The irradiated chamber was first flushed with pure air and then auto exhaust at 5000 or 7200 ppm by volume was allowed to enter the chamber after passing through the inlet filter. As soon as steady state concentrations were reached, the chamber irradiation lamps were turned on. The experiments were dynamic in nature with 1-hr residence time for the mixture in the chamber during which period the irradiation took place. The aerosol under study was that generated essentially in a stirred flow reactor. The runs lasted up to 9 hr in order to collect samples of sufficient size for the standard microanalytical techniques to be used in the analyses. Microcombustion technique, microanalytical chemical techniques and infrared absorption spectrum measurements are reported. Irradiated auto exhaust appears to be the principal source of nitrate, sulfate, lead, and organic compounds in the particulate matter of Los Angeles smog. Further, these findings explain the higher values of nitrate and sulfate found in Los Angeles and other similar West Coast cities in comparison with other cities. Assuming six million gallons of gasoline are consumed in auto engines per day in Los Angeles, about one ton per day of non-irradiated particulate and at least 10 tons per day of photochemically generated particulate are present in a typical smog.##

06056

R. J. Grant and R. Manes

ADSORPTION OF BINARY HYDROCARBON GAS MIXTURES ON ACTIVATED CARBON. Ind. Eng. Chem. Fundamentals 5(6):490-498, Nov. 1966.

The Polanyi adsorption potential theory is extended to predict the adsorption of binary gas mixtures on activated carbon. The

calculation method assumes that the adsorbate behaves as an ideal liquid mixture and that the total adsorbate volume determines the adsorption potential of each pure component and hence its adsorption pressure as a pure gas. The method in principle applies to a wide variety of binary mixtures and can be extended to multicomponent systems. It is here successfully applied to new data on mixtures of methane with propane, butane, and hexane at 25 C, and total pressures up to 1000 p.s.i.g., as well as to literature data at atmospheric pressure. (Authors' abstract)##

06102

H. Endow, O. J. Doyle, and J. L. Jones

THE NATURE OF SOME MODEL PHOTOCHEMICAL AEROSOLS, J. Air Pollution Control Assoc. 13 (8), 341-7 (Apr. 1963). (Presented at the 55th Annual Meeting, Air Pollution Cont Association, Chicago, Ill., May 20-24, 1962.)

To obtain greater knowledge of the chemical nature of that part of smog which reduces visibility, its significance to health and its formation in model aerosols were generated by the photo-oxidation of a single hydrocarbon, by nitrogen oxides and, in most instances, by the co-photooxidation of a third component-sulfur dioxide. The model aerosols are the result of the same type of process which undoubtedly takes place in the atmosphere, but the complexity of the reactions is considerably reduced and the chemical composition is more closely controlled. Evidence from infrared spectra of precipitated model aerosols formed by the photo-oxidation of lower olefin homologs-nitrogen oxides-sulfur dioxide mixtures at 50% relative humidity indicated that the principal constituent of the aerosol was sulfuric acid. Other analytical data, microchemical elemental analysis, spot tests, and the like, gave support to the belief that the principal constituent of these aerosols was sulfuric acid. In addition to sulfuric acid, the aerosols contained a smaller concentration of nitrite-type material. Weight loss studies of precipitated aerosols indicated either that portions of the condensed aerosol materials were volatile or that the aerosol was unstable and a decomposition product was volatile.##

06102

Billings, C. E.

EFFECTS OF PARTICLE ACCUMULATION IN AEROSOL FILTRATION (A DOCTOR'S THESIS). For the degree of Doctor of Philosophy, California Inst. of Tech., Pasadena. (1966). 211 pp.

The filtration of solid aerosol particles produces a decrease in filter penetration and an increase in filter resistance because of the accumulation of deposited material. Functions are derived for the effects of particle accumulation on filter penetration and resistance. A new aerosol tunnel is described which provides a uniform field of particle and fluid flow for extended periods. Data are presented on the effects of accumulation of 1.3-micron polystyrene particles on the performance of filter mats tested in the aerosol tunnel. A quantitative microscopic study of accumulation of 1.3-micron particles on single isolated 10-micron glass fibers is described. Photographs of deposit structure and measurements of aggregate size are included. (Authors abstract)

06695

B. S. Tsay

A DISCUSSION OF THE FORMULA S USED IN COMPUTING THE AMOUNT OF FUEL REQUIRED TO PRODUCE COMBUSTION GASES AT A GIVEN TEMPERATURE IN A COMBUSTION CHAMBER OR AN AFTERBURNER. Chi Hsieh Kung Ch'eng Hsueh Pao [Chinese J. Mechanical Engineering] 12 (3), 95-6 (1966) Chin. (Tr.).
CFSTI,DDC: AD 625 788
AD 625 888

A generalization of 3 formulas for calculating the amount of fuel required to produce combustion gases at a given temperature in a combustion chamber or in an afterburner is presented. The applicability of the original formula based on (CH)n fuel to other fuels is discussed. (Author's abstract, modified)##

06698

Matsak, V. G.

VAPOR TENSION AND VAPORIZATION OF SUBSTANCES IN MOVING AIR. Gigiena i Sanit., (8) 35-41, 1958. In: U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Translated from Russian by B. S. Levine, Vol. 8, 1-9, 1962
CFSTI: 62-11103

The purpose was to place at the disposal of engineers and hygienists working in the field of sanitary technology basic data regarding vapor tension and rate of vaporization of different inorganic and organic substances in moving air. Particular emphasis was placed on substances, and especially toxic substances, most commonly used in industrial technology. Such information should allow hygienists to evaluate the potential danger associated with vaporization of toxic substances in relation to their physico-chemical and toxicological properties, and sanitary engineers to apply it in their computation of air ventilation in general and of quantitative determination of the degree of air charged with vapor of high-molecular substances, and in correctly distributing incoming and exhaust air, and in computing other means required for the sanitary improvement of labor conditions. It is suggested that sanitary engineers use the nomograms presented especially where a 5% error is permissible. More than 85 chemically pure substances are represented in three nomograms and two tables.##

06699

B. W. Hues, R. Dimitriades, and R. D. Fleming

HOW HYDROCARBON TYPES DETERMINE SMOG-FORMING POTENTIAL OF EXHAUST GASES. S.A.E. (Soc. Automot. Ineng.) J. 74 (2), 59-61 (Feb. 1966).

Relationships between automobile exhaust gas reactivity under irradiation and composition of unburned hydrocarbons in the

exhaust was studied over a wide range of fuels and driving conditions. Indices measured were: rate at which NO is converted to NO2; oxidant formation; and formaldehyde formation. These were correlated with concentrations of: unsaturates plus oxygenates; non-aromatic unsaturates plus oxygenates; and non-aromatic unsaturates plus oxygenates, less acetylene and propylene. Correlation between composition and chemical reactivity is not consistent. Oxidant formation is constant within experimental error limits. Variability in the rate of NO2 formation is considered to be due to variations in composition, including variations in molecular weight, within each of the general classifications with which reactivity correspondence was sought. Inherently low precision of the analytical method may be at fault for the + or - 30% scatter shown in formaldehyde-formation data. For exhaust samples of similar origin (that is, the same fuel), a fairly well defined correlation exists between reactivity and composition. Extracting all or part of the unsaturates and oxygenates from exhaust samples does tend to reduce their reactivity. Nitrogen oxides also play a complex role in determining reactivity. In a hydrocarbon-nitrogen oxides mixture, reactivity is more or less a monotonic function of the hydrocarbon concentration, but its dependence on nitrogen oxides is not monotonic. Comparing the reactivity of two exhaust samples, therefore, means taking account not only of reactive hydrocarbon concentrations, but also their ratios to nitrogen oxides, as well as the direction in which the hydrocarbon to nitrogen oxides ratio affects reactivity.##

06720

A. J. Fatiadi

EFFECTS OF TEMPERATURE AND OF ULTRAVIOLET RADIATION ON PYRENE ADSORBED ON GARDEN SOIL. Environ. Sci. Technol. 1 (7), 570-2 (July 1967).

Irradiation of pyrene adsorbed on garden soil for 240 hrs at 33 degrees gave a mixture of products that could be separated by thin-layer and column chromatography. Eight compounds were formed, and five have been identified: 1,1'-bipyrene, 1,6- and 1,8-pyrenediones, and 1,6- and 1,8-pyrenediols. When the pyrene adsorbed on garden soil was stirred in the dark for 240 hrs at 33 degrees, the yield of 1,1'-bipyrene was lowered (from 4 to 6%) to 0.1%, and only traces of the two diones were formed; on treatment in the dark at 110 degrees for only 8 hrs, dione yields were increased to 2.5%. When other particulates (silica gel, alumina, Florisil, etc.) were used instead of garden soil, 1,1'-bipyrene was not formed. Experiments in which radical-capture agents were incorporated showed lower yields of 1,1'-bipyrene, indicating that the reaction with ultraviolet irradiation involves a free-radical mechanism. The yield of the diones was unchanged with these agents present, suggesting that they are formed by attack of adsorbed oxygen on photo-excited pyrene molecules. Irradiation of pyrene in the crystalline form without soil did not produce 1,1'bipyrene. No attempt was made to follow quantitatively the input of energy during the irradiation of pyrene on soil (a heterogeneous reaction); from the practical standpoint, however, the main objective of this study was to trace the fate of pyrene on soil, as a representative reaction of a series of polycyclic, aromatic hydrocarbons (carcinogenic and non-carcinogenic). (Author abstract)##

06966

A. J. Fatiadi

SEPARATION OF PYRENEDIONES BY COLUMN CHROMATOGRAPHY. J. Chromatog. 20, 319-26 (1965).

Pure 1,6 - 1,8 and 4,5 pyrenediones were needed as reference compounds in connection with studies on the photochemical oxidation of pyrene. The procedure reported by Vollmann for the preparation and separation of 1,6 and 1,8 pyrenediones involves a laborious series of processes. After tests with a variety of adsorbents and solvents, it was found that 1,6 and 1,8 pyrenediones, in an oxidation mixture obtained from pyrene, are separated directly on a column of silica gel with glacial acetic acid as an eluate. The final purification of 1,6 pyrenedione was accomplished on a column of activated alumina with benzene as a solvent. The composition of each eluted fraction was checked by thin layer chromatography. The infrared and UV spectra of the purified diones and of 1-oxo-6,7 phenalenedicarboxylic acid anhydride were recorded.##

06997

B. H. Fabuss, A. S. Borsanyi, D. A. Duncan, H. Kaufman, J. O. Smith

RESEARCH ON THE MECHANISM OF THERMAL DECOMPOSITION OF HYDROCARBON FUELS. Monsanto Research Corp., Everett, Mass. Boston Labs. (Aug. 1964). 120 pp. (Rept. No. ASD-TDR-63-103, Part II.)

The decomposition and particle formation of 20 naphthenic and 8 paraffinic hydrocarbons were studied. The decomposition approximately a first-order kinetic process, although self-acceleration was observed with most monocyclic hydrocarbons and self-acceleration was observed with most monocyclic hydrocarbons and self-inhibition was observed for polycyclic hydrocarbons. Pressure increased the decomposition rate. A detailed study of the effects of organosulfur contaminants was made. These contaminants inhibited the cracking of naphthenes and straight-chain paraffins and accelerated the cracking of branched paraffins. An increase in contaminant concentration and an increase in the number of methyl substituent groups on a hydrocarbon increased this effect. Several binary hydrocarbon mixtures were cracked. The component hydrocarbons did not crack independently. Nevertheless, the decomposition rate of the mixture could be predicted assuming no mutual interferences in decomposition. The micro-coker, a new small-scale device for studying decomposition and deposit formation in a flow system, was developed. (Author abstract)##

07108

Bonsetti, M. A. and G. J. Doyle

PHOTOCHEMICAL AEROSOL FORMATION IN SULFUR DIOXIDE-HYDROCARBON SYSTEMS. Intern. J. Air Water Pollution, 2:337-345, June 1960. 31 refs. (Presented at the Int. Clean Air Conf., London, Engl., Oct. 20-24, 1959.)

A series of photochemical experiments were conducted in a 50-l. stirred-flow reactor to study aerosol formation from different hydrocarbons in the presence of nitrogen oxides and sulfur dioxide. Irradiation by simulated sunlight of trace concentrations (p.p.m.) of the reactants, in some cases yielded particles in the size regime 0.1-0.3 micron diameter, which by scattering of light are important to visibility in the atmosphere. A large number of experiments with 1 p.p.m. of various hydrocarbons, 1 p.p.m. nitrogen oxides, and 0.1 to 0.5 p.p.m. SO2 indicated that the olefinic hydrocarbons were the only important aerosol formers in contrast to the paraffinic and aromatic hydrocarbons. It was observed that the photolysis of sulfur dioxide proceeds at the rate of 0.5 per cent per minute. The high sulfate content of the particulate matter and low gaseous sulfur dioxide concentrations observed in the Los Angeles smog are consistent with the findings of this laboratory program. (Authors' summary, modified)##

07168

R. M. Pogiazova, G. P. Fedoseeva, A. J. Phenine, M. M. Meinsel, and L. M. Shabad

DESTRUCTION OF BENZO(A)PYRENE BY SOIL BACTERIA. Life Sci. 6(10):1053-1062, 1967.

Data are given on the presence of bacteria capable of accumulating and destroying the carcinogen, benzo(a)pyrene, which is found in the air and soil of large modern cities. Samples collected on the land of an old oil refinery contained up to 200 ng of benzo(a)pyrene per kilogram of soil. Seventeen strains of spore-forming bacteria, some of which belong to the Bacillus aegaterium species were isolated from soil samples and grown on meat infusion agar. The cultivated bacteria accumulated and destroyed the benzo(a)pyrene in the nutrient media and in the soil. It was possible to increase the ability of the soil bacteria to destroy benzo(a)pyrene by prolonged cultivation in media containing the hydrocarbon. The benzo(a)pyrene content of the samples was followed by quantitative spectral fluorescent methods. A fundamental method of biologically reducing the carcinogenic hydrocarbons in the soils is given.##

07271

Whitby, K. T., B. Y. H. Liu, and A. R. McFarland

A STUDY OF ATOMIZER AEROSOL GENERATORS (INTRODUCTION-SECTION 1). (Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering), Progress rept. no. AP 00400-2, p. 1-10, Aug. 1967. 5 refs.

The further development of three generators was attempted. The first of these is an atomizer type generator which is suitable both for polystyrene latex aerosol generation and for the generation of moderately monodisperse submicron aerosols by the atomization of the dye solutions. The second is a condensation type generator capable of generating high concentrations of monodisperse aerosols from the atomization, evaporation, and recondensation of such substances as DOP, glycerol, and triphenylphosphate. The third generator is an advance version of the Model II spinning disk

aerosol generator previously developed. The principal specifications of the generators and the progress to date are reviewed.##

07272

Liu, B. Y. H.

METHODS OF GENERATING MONODISPERSE AEROSOLS (SECTION II). In: A Study of Atomizer Aerosol Generators. ((Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering)). Progress rept. no. AP 00880-2, Publication no. 108, Dept. no. COO-1280-10, p. 1-28, Aug. 1967. 32 refs. Presented at the 6th Conf. on Methods in Air Pollution and Industrial Hygiene Studies, Oakland, Calif., Feb. 6-8, 1967.)

The methods of generating monodisperse aerosols are discussed. The principal characteristics, advantages and limitations of the following methods are given: spinning disk aerosol generator, atomizer-impactor generator and condensation generator.##

07273

Whitby, K. T. and Y. H. Liu

POLYSTYRENE AEROSOLS--ELECTRICAL CHARGE AND RESIDUE SIZE DISTRIBUTION. (SECTION III). In: A Study of Atomizer Aerosol Generators. ((Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering)) p. 1-32, Aug. 1967. 16 refs. Also: ((Atmospheric Environ.)), 2 (2):103-116, March 1968.

The complete size distribution of polystyrene aerosols produced from a dilute hydrosol of the polystyrene latex particles by the atomization and evaporation process has been measured over the size range, 0.002 microns to 5 microns in 10 size intervals by means of an aerosol counting and size distribution measuring system consisting of three instruments in parallel operations: a condensation nuclei counter, an electric particle counter, and an optical particle counter. The concentration of the residue particles resulting from the evaporation of the empty liquid droplets containing no PSL particles has been found to be approximately five orders of magnitude higher than the monodisperse PSL particles. The use of an impactor with a sharp 2 micron droplet cut-off has been shown to be effective in improving the monodispersity of the generated polystyrene aerosol. The improvement apparently resulted from the reduced number of multiplets formed. The electrostatic charge on the PSL particle has been measured and the median charge has been found to be on the order from 10 to 100 elementary electron units. However, some particles have been found to carry over 600 units of charge. Charges of these magnitudes are approaching or even exceeding the maximum charge that can be placed on these particles in an electrostatic precipitator and undoubtedly can have a very substantial effect on the behavior of the aerosol. A radioactive $Kr-85$ gas of 0.5 millicurie activity has been found to be an effective means of neutralizing the aerosol charge. (Authors' abstract, modified)##

07195

R. D. Schwartz, R. G. Mathews, D. J. Brennecke

RESOLUTION OF COMPLEX HYDROCARBON MIXTURES BY CAPILLARY COLUMN GAS CHROMATOGRAPHY - COMPOSITION OF THE 80 DEGREES - 180 DEGREES C AROMATIC FRACTION OF PETROLEUM. J. Gas Chromatog., 5(5):251-253, May 1967. 7 refs.

The selectivity of a number of liquid substrates, for the separation of the 80 degrees -180 degrees C aromatic hydrocarbons, has been investigated. Capillary columns coated with esters which form pi-complexes with the aromatics are particularly useful for these separations. Modification of the ester substrate by the addition of other suitable solvents is necessary in order to obtain the optimum selectivity for the resolution of this complex mixture containing several closely related hydrocarbon isomers. It is possible to separate these 31 aromatic hydrocarbons, in approximately 95 minutes, with a 200 ft. length of 0.01 inch I.D. stainless steel coated with a modified pi-complexing substrate. (Authors' abstract) 00

07457

Benson, S. W. and F. Shaw

KINETICS AND MECHANISM OF THE PYROLYSIS OF 1,4-CYCLOHEXADIENE. Trans. Faraday Soc., 63(532):985-992, April 1967. 18 refs.

The homogeneous gas-phase pyrolysis of 1,4-cyclohexadiene has been shown to obey the pattern of reactivity of cyclic olefins. The reaction was studied using mass spectrometry, u.v. spectroscopy, gas chromatography, and pressure measurements. The process is first order to at least 80% decomposition. The rate constant has been measured over a range of seven powers of ten, in packed and unpacked, static and flow reactors between 250 and 620 deg C and between 0.001 and 100 torr. The absence of hydrogen atoms has been shown by the lack of exchange with hexadeuterobenzene and toluene. The chain decomposition involving cyclohexadienyl radicals is, therefore, not important, probably due to the endothermicity and low A-factor of the bimolecular initiation. From the Arrhenius parameters for the intramolecular elimination of hydrogen from 1,5-CH, and from estimates of the entropy and heat changes, the rate constant for the diamagnetic 1,4-hydrogenation of benzene was calculated. (Authors' abstract, modified) 00

07458

Benson, S. W. and G. B. Haugen

MECHANISMS FOR SOME HIGH-TEMPERATURE GAS-PHASE REACTIONS OF ETHYLENE, ACETYLENE, AND BUTADIENE. J. Phys. Chem., 71(6):1735-1746, May 1967.

Sufficient information concerning the rate parameters of the individual propagation and termination steps of radical reactions now exists so that it is possible to predict the kinetic behavior of a chain mechanism with better than order-of-magnitude

reliability. This precision comes from the elucidation that exist between the A factors and activation energies of homologous reactions. In particular, the creditability of a proposed chain mechanism for the high-temperature gas-phase reaction of unsaturated hydrocarbons can be tested by comparing the observed kinetic behavior with that predicted by the mechanism. A pyrolytic chain was proposed that adequately describes the experimentally observed high-temperature hydrogenation of acetylene and also the high-temperature pyrolysis of ethylene. The propagation steps representing the formation of the major products of these systems are diagrammed. The minor product in both systems is 1,3-butadiene. In the pyrolysis of ethylene, the side reaction accounts for the production of butadiene. In the case of the hydrogenation of acetylene, a concurrent chain is responsible for the side products. (Authors' abstract, modified)##

07962

Egger, Kurt W. and Sidney W. Benson

SOME OBSERVATIONS ON THE KINETICS OF HYDROGEN IODIDE ADDITION TO 1,3- AND 1,4-PENTADIENE. J. Phys. Chem., 71(6):1933-1936, May 1967.

Quantitative kinetic information on the addition of HI to olefins, obtained complementary to reported studies of the iodine atom catalyzed isomerization and dimerization of n-pentadienes in the gas phase is reported. The rate of addition of HI to either 1,3- or 1,4-pentadiene was checked as a possible side reaction in these studies. It was found that, during the isomerization of 1,4-pentadiene in the absence of iodine at temperatures between 1,4-pentadiene in the presence of iodine at temperatures between 420 and 515 deg K, 5-10% monoolefins had been produced. Rate constants were calculated from pressure measurements, as only the constants were calculated from pressure measurements, as only the rate-controlling step leads to a pressure change. The iodine buildup during the reaction, monitored spectrophotometrically, checks out within experimental error limits with the amount of saturated hydrocarbon or monoolefin, respectively, measured by gas-liquid chromatography. The measured pressure changes are in reasonable agreement with the iodine produced. The method and experimental procedures used have been reported in detail earlier. The results are summarized here. A more careful and detailed study of the HI addition to 1,3-pentadiene is needed before any further conclusions can be drawn. There is no doubt, though, that HI adds much faster to the conjugated olefinic bond and it is believed that this corresponds to the homogeneous reaction rate.##

07963

Harrison, Arthur P., Jr., and Vivian E. Basbe

FACTORS INFLUENCING THE PHOTODYNAMIC ACTION OF BENZO A PYRENE ON ESCHERICHIA COLI. J. Bacteriol., 93(2):618-626, Feb. 1968. 23 refs.

Death of Escherichia coli resulted when a buffer suspension was exposed simultaneously to colloidal benzo a pyrene (BP) and 365-millimicrons illumination. Neither hydrocarbon nor illumination alone caused death; oxygen had to be present. The survival curve had a shoulder, and then death proceeded

exponentially with time. Death rate was independent of temperature between 6 and 32 C. The duration of the shoulder, however, decreased slightly with increase in temperature. The shoulder was not due to delay in BP entering the cell. Death was influenced by the composition of the medium in which the cells were grown prior to illumination. The amount of BP bound to the cells was determined after three ethyl alcohol-ether extractions. Appreciable binding occurred in the presence of 355-millimicrons illumination with air, and relatively little binding occurred under nitrogen; very little binding occurred in the dark with nitrogen or air. At the outset, rate of binding under illumination with air was not temperature-dependent, but with time it became strongly temperature-dependent. Binding under illumination with nitrogen was temperature-independent. Bound BP was associated primarily with cell protein. Cells in growth medium resisted death and BP binding. At 21 and 32 C, deoxyribonucleic acid damage occurred during exponential death. No damage was detected at 21 and 32 C in the dark with BP, under illumination in absence of O_2, or under illumination with BP in a nitrogen atmosphere. (Authors' abstract)##
(Authors' abstract)##

07495

Ciborowski, J. and H. Pohoreckí

THE EFFECT OF ELECTRICAL DISCHARGES ON SUBLIMATION CONDENSATION. Int. Chem. Eng., 7(1):58-59, Jan. 1967. 55 refs. Translated from Chem. Stosowana, Vol. 2B, p. 159-182, 1966.

The effect of electrical discharges on the condensation of vapor at temperatures below the triple point has been studied. A simplified schematic diagram of the apparatus used is presented. It was composed basically of a saturator, a heater, a superheater, an ionizer, and a condensation chamber. The condensation was carried out by mixing a hot stream of gas containing vapors of the condensing component (naphthalene) with a stream of cold inert gas. It was concluded that: the existence of a considerable effect of electrical discharges on the course of sublimation condensation has been established. This effect is based primarily on intensification and simultaneous stabilization of the course of the processes. The effect of discharges on the condensation process depends on the type of discharge. This effect is considerable in the case of spark discharges, but in the case of corona discharges it was not observed at all. The magnitude of the effect observed depends to a small degree on the voltage (if it is large enough for spark discharges to occur). This magnitude also depends on the thermodynamic parameters of the system; however, no dependence on the flow rate of the gas through the ionizer was observed (within the investigated limits of changes of this value). The effects of electrical discharges on the condensation process can be explained by the formation of a larger number of active condensation nuclei, which facilitate nucleation of the new phase.##

07496

Hughes, A. N., R. D. Scheer, and R. Klein

THE REACTION BETWEEN O(3P) AND CONDENSED OLEFINS BELOW 100 DEG K. J. Phys. Chem., 70(3):798-805, March 1966.

The addition of oxygen atoms to condensed simple olefins has been studied in the 77 to 90 deg K temperature range. The ground-state O(3P) atoms were generated in the gas by dissociation of O2 on rhenium or tungsten surfaces heated to 2100 deg K. At 90 deg K and oxygen pressures below 90 atorr, the major products were found to be the unfragmented epoxides and carbonyls. Above 50 atorr, peroxides and oxygenated products characteristic of rupture at the double bond were observed. Above 100 atorr only the peroxides and their fragments were produced. At 77 deg K, the peroxolysis reaction occurred at much lower oxygen pressures. Comparison of these results with those obtained in the gas phase at 300 deg K indicates that the low-temperature environment efficiently removes the excess energy from the excited biradical formed in the primary act of O atom addition to the double bond. In all cases studied, fragmentation was less extensive than the comparable gas phase process. (Authors' abstract)##

01509

Scheer, Milton D. and Ralph Klein

OXYGEN ATOM REACTIONS WITH CONDENSED OLEFINS. Science, 150(3523):1719, June 5, 1965. 9 refs.

Gaseous oxygen atoms, thermally generated from O2 on a 2100 deg K zirconia surface, react with simple condensed olefins below 100 deg K. Initial results indicate that the distribution of products differs from that obtained in the gas phase at higher temperature. Reaction between the condensed olefins and oxygen atoms differ from the gas phase results in that neither CO nor CO2 are formed as reaction products. (Authors' abstract, modified)##

01510

Schneider, Donald A. and Jerrold Meinwald

PHOTOCHEMICAL REACTIONS OF ALPHA, BETA-UNSATURATED CARBONYL COMPOUNDS WITH OLEFINS. J. Am. Chem. Soc., 89(9):2023-2033, April 26, 1967.

The synthesis of trans-5,5,6-trimethyl-3,6-heptadien-2-one is described. Upon irradiation, it is converted into the cis isomer which undergoes two modes of intramolecular cycloaddition to form 1,6,7,7-tetramethyl-3-oxabicyclo(3.1.0)hept-4-ene and 1,3,6,6-tetramethyl-2-oxabicyclo(3.1.1)hept-3-ene. The cycloadditions are considered to proceed through a diradical intermediate formed from s-cis. It is suggested that s-cis or s-trans conformational preference may be an important factor in determining the mode of photoreaction of alpha beta-unsaturated carbonyl compounds with olefins. The s-trans-1-acetylcyclohexene was found to react with isobutylene to form cis-1-acetyl-2-methylallylcyclohexane without side reactions. Several s-cis enones were found to be photochemically reactive. Some general rules are presented which summarize existing observations for this class of reactions.##

07512

Slater, David H.; Susan G. Collier, and Jack G. Calvert

THE PHOTOLYSIS OF 1,1'-AZOISOBUTANE VAPOR AT 3660 A; THE REACTIONS OF THE ISOBUTYL FREE RADICAL. Preprint, Ohio State Univ., Columbus, Evans Chem. Lab., (25) p., (1967).
(Presented at the Robert Livingston Photochem. Symposium, Minneapolis, Minn., May 9, 1967 and 154th Nat. Meeting, Amer. Chem. Soc., Chicago, Ill., Sept. 1967.)

The vapor phase photolysis of 1,1'-azoisobutane was studied in experiments at wavelength 3660 A and at various temperatures and pressures. The product rate data fit well the suggested reaction scheme involving an excited azoisobutane molecule and reactions of the isobutyl free radical. The ratio of rate constants for the disproportionation and combination reactions of the isobutyl radical was estimated to be 0.075 plus or minus 0.007 (25-160 deg). Rate constants for the H-atom abstraction and the decomposition reactions of the isobutyl radical were derived. From the effects of pressure and temperature on the quantum yield of nitrogen, an estimate was obtained for the rate constant for the excited azo-molecule decomposition reaction. If the excited singlet were the reactant, then fluorescence emission should be observable from the azoisobutane. No emission was detectable even in experiments at -190 deg.##

07607

Stein, H. C.; J. J. Feenan, G. P. Thompson, J. F. Schultz, L. J. E. Hofer, and R. B. Anderson

THE OXIDATION OF HYDROCARBONS ON SIMPLE OXIDE CATALYSTS. J. Air Pollution Control Assoc., 10(6):475-481, Aug. 1960. 2 refs.
(Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

A large number of catalysts have been laboratory tested for the oxidation of various hydrocarbons for the purpose of developing catalysts which may be suitable for oxidizing hydrocarbons in automobile exhaust gas. A large number of catalysts were tested using the rapid microcatalytic- chromatographic technique. A group of eight hydrocarbons was selected for study, comprising n-pentane, isopentane, pentene-2, pentyne-1, n-hexane, cyclohexane, 2,3-dimethylbutane, and benzene. Many oxides of some of the metals of groups IB, VB, VIB, VIIB, and VIII of the periodic table were selected. A list selected from the oxides used, together with their B.E.T. surface areas and x-ray diffraction data is shown in Table I. Results show that: branched hydrocarbons are more difficult to oxidize than normal hydrocarbons; ease of oxidation increases with molecular weight in homologous series; unsaturated aliphatic hydrocarbons are more easily oxidized than the corresponding paraffins; in comparing open chain and cyclic compounds having the same number of carbon atoms, reactivity toward oxidation probably decreases according to the sequence; the most active single oxide catalysts were found to be the oxides of cobalt, nickel, manganese, chromium, cerium, titanium, and iron. It is conceivable that different forms or preparations of the same oxide would have different activities. The microcatalytic - chromatographic technique has proved to be a very convenient means for rapid screening in oxidation studies. It is to be recommended where a

large number of catalysts or reactants are to be investigated or where a wide range of temperatures is to be used.

07692

General Electric Company, Lynn, Massachusetts, Direct Energy Conversion Operation

HYDROCARBON - AIR FUEL CELLS. Contract No. Da 44-009 ARC 479 (T), Technical Summary Rept. No. 10, 235p., Dec. 31, 1966.
CFSTI, DDC: AD 649695

Detailed information is presented on a continuing research and development program to develop a direct hydrocarbon oxidation-air fuel cell technology. Current work included research on electrocatalysts, multi-component fuels, and investigations with alternate acid electrolytes. Phosphoric acid seemed to be the best electrolyte in spite of the anodic cycling which has been observed in single cells. Teflon-bonded platinum electrodes supported on tantalum screens were chosen in spite of their limited life and high cost. Normal octane was chosen as the fuel, even though it also is expensive. The result of the system study was, therefore, a view of the upper limit in performance attainable today, even though the system is expensive. The system analysis of a direct liquid hydrocarbon system showed the optimum components and conditions to be: (1) Phosphoric acid electrolyte@ about 96 w/o at 150 C, with a 1/16 inch electrolyte; (2) Platinum electrodes of active area 10 by 15 inches; (3) Normal octane as the fuel and air as the oxidant; and (9) Three times stoichiometric reactions air. Such a system is capable of delivering 500 watts net at an overall efficiency of 20 percent based on higher heating value. The system is water conservative at ambients of 85 F or lower. About 50 watts is needed for parasitic power if free convection cooling is used. Not much system weight reduction could be obtained by decreasing the electrolyte gap by half, but the weight could be reduced by 40 percent by designing for an operating temperature of 180 C. The high concentration of acid needed at 180 C poses a problem of electrolyte solidification upon cooling after shutdown of the unit. Free convection cooled auxiliaries were favored for system simplicity and higher efficiency. A conceptual layout of a 0.5 kw system for the free convection configuration operating at 150 C is presented.

07705

Annet, Gabrielle and Thomas G. Hutchins

LEEWARD DEPOSITION OF PARTICLES ON CYLINDERS FROM MOVING AEROSOLS. Am. Ind. Hyg. Assoc. J., 28(4):348-351, July-Aug, 1967. 9 refs.

A study of leeward deposition of moving aerosols on cylinders was conducted by exposing glass rods of various dimensions to aerosols in a wind tunnel. Particles of several size ranges were carried to the target at three different velocities. For each exposure, the ratio between the number of particles counted on the leeward side of the cylinder and the number counted over an equal area on the windward side was calculated, as was the impaction parameter corresponding to the mean particle size. When the impaction

parameter was smaller than 0.005, the ratio did vary, generally showing an increase with decreasing particle size and wind velocity but with increasing cylinder size.

07791

Benson, S. W.

MECHANISM OF THE DIELS-ALDER REACTIONS OF BUTADIENE. J. Chem. Phys., 46(12):4920-4926, June 15, 1967.

Kinetic data on the pyrolysis of 1,5-cyclooctadiene to give butadiene and 4-vinyl cyclohexene by parallel paths are analysed and shown to be quantitatively consistent with a common biradical precursor, the octadien-2,6,-diyl-1,8 biradical. It is further shown that these data are in excellent agreement with independent studies of the reverse reactions; pyrolysis of 4-vinyl cyclohexene to butadiene and the dimerization of butadiene. A fourth study of the pyrolysis in solution of 1,2-divinyl cyclobutane to give butadiene, 1,5-cyclooctadiene, 4-vinyl cyclohexene, and cis-trans isomerization is shown to fit the same scheme with only minor modifications in two of the rate constants. The analysis lends support to the 12.5-kcal assignment of the allyl stabilization energy. It also resolves an apparent anomaly in the rate parameters for the reverse Diels-Alder pyrolyses of cyclohexene, 1-methyl cyclohexene, and 4-vinyl cyclohexene. Arrhenius parameters for all the elementary rate constants are assigned and shown to be reasonable compared to similar processes. Important rotation-controlled rates in the scheme are examined and conclusions drawn about the contributions of different rotomeric forms of the biradical. (Author's abstract)##

07794

Heus, L. D.; J. L. Jacobson, H. Schaffner, and J. N. Pitts, Jr.

STRUCTURE AND REACTIVITY IN THE VAPOR-PHASE PHOTOLYSIS OF KETONES. V. ALIPHATIC CYCLOPROPYL AND OLEFINIC KETONES. J. Am. Chem. Soc., 89(15):3684-3688, July 19, 1967. 34 refs.

Vapor-phase irradiations of the aliphatic cyclopropyl and olefinic ketones, methyl cyclopropyl ketone(I), 1-cyclopropyl-2-propanone (II), 1-cyclopropyl-3-butanone (IV), and 1-penten-4-one (III) at 3130 A and 120 degrees have been carried out. Quantum yields of yields of carbon monoxide from the type I split are 0.05 for ketone I, 0.09 for ketone II, 0.71 for ketone IV and 0.60 for III. Other primary photochemical processes in these ketones are the isomerization of cyclopropane in compounds I and II, and the type II split in compound IV. The data from these reactions together with previously reported results provide the basis for a coherent evaluation of the relationship between structure and photoreactivity in the vapor phase at 3130A and 120 degrees of the two series of closely related aliphatic and cyclic ketones which possess cyclopropyl and double bonds, respectively, in the alpha, beta and gamma positions to the carbonyl group. (Authors' abstract, modified)

07806

Alley, F. C.

A BENCH SCALE REACTION SYSTEM FOR MEASURING ATMOSPHERIC SMOG POTENTIAL. Preprint, Clemson Univ., S. C., Chemical Engineering Dept., (10p.), 1966. (Presented at the 21st Annual Instrument Society of America Conference & Exhibit, New York City, Oct. 24-27, 1966, Paper No. 11.3-1-66.)

Photochemical smog results when the atmosphere contains certain hydrocarbons and oxides of nitrogen and is irradiated under favorable conditions of temperature and humidity. If smog control efforts are to be successful, the complex series of reactions by which smog is produced must be completely understood from a standpoint of reaction mechanism and kinetics. This paper describes a bench scale photo-chemical reaction system for simulating the processes occurring when a polluted atmosphere is irradiated by sun light. The flexibility of the system as well as the capabilities and limitations of several existing pollutant monitoring devices are discussed. (Author's abstract)

07808

Norris, Logan A. and David Greiner

THE DEGRADATION OF 2,4-D IN FOREST LITTER. Bull. Environ. Contamination Toxicol., 2(2):65-74, 1967. 9 refs.

The influence of forest litter type and several chemical factors on the persistence of 2,4-D in forest litter was determined. 2,4-D is rapidly degraded in forest litter and the rate of degradation varies with the type of litter, herbicide formulation and the presence of DDT. The degradations of 2,4-D varies slightly in litter from different vegetation types when incubated under similar environmental conditions. Greater variation in herbicide degradation rates may be expected in the field; but this will be due primarily to differences in the site microenvironment, rather than inherent differences in the litter. Various formulations of 2,4-D are degraded at different rates in forest litter although this is believed to be more a function of constituents of formulation than a direct effect of the technical acid, salt or ester. Finally, these experiments have shown that up to 5 gallons per acre of diesel oil has little or no effect on the decomposition of 2,4-D isooctyl ester, while 1 lb./A. of DDT appears to stimulate herbicide degradation. AUTHOR

08078

Rasel, Montaie H. and Eric A. Lundstrom

CONTINUOUS GAS MIXING BY THE USE OF CRITICAL FLOW THROUGH SMALL DIAMETER TUBES. California Univ., Berkeley, Coll. of Engineering, Grant AF-AFOSR-129-67, TR-2-67, AS-67-3. (160)1p., March 1967. 10 refs.
CFSTI; DDC: AD 651647

A continuous-flow gas mixing device is introduced utilizing critical flow in small-diameter tubes and commercially available hypodermic needles, where the flow rate is fixed by the stagnation pressure upstream. The assumption of laminar adiabatic flow of a perfect gas with friction is found to be adequate for smaller I.D. tubes. This assumption becomes less accurate for larger tubes or higher stagnation pressures due to increasing Reynolds numbers beyond the laminar-transition region. The continuum assumption holds for all gases considered (hydrogen, helium, hydrogen, acetylene, Nitrogen, oxygen, and Argon) excepting hydrogen and helium where slip flow occurs at low pressures for small diameter tubes. This effect can be neglected experimentally where it is over-shadowed by the larger effect due to tolerance in the inside diameter of the tubes. Hypodermic needles of regular tip and nominal length equal to the required length can be used directly introducing an error less than 10 percent due to the combined effect of tolerance, pointed tip, and longer actual length. Less error can be obtained by painting the needle with insulating material to reduce heat transfer and by grinding the tip to the required length. In the latter case, care must be taken to keep the tip clean and undistorted. For greater accuracy each needle should be calibrated individually. AS

08105

R. S. Juvet, Jr. R. L. Tanner, J. C. Y. Tsao

PHOTOLYTIC DEGRADATION AS A MEANS OF ORGANIC STRUCTURAL DETERMINATION. J. Gas Chromatog., 5(1):15-21, Jan. 1967. 15 refs.

Difficulty reported by many authors obtaining reproducible results in inter-laboratory studies using the pyrolysis-gas chromatographic technique prompted an investigation of other, more reproducible, methods of sample decomposition. The method chosen was mercury-sensitized photolytic decomposition because of the simplicity of the experimental technique, the simplicity of the fragmentation patterns, the predictability of the decomposition products, and the availability of ultraviolet light sources in many well-equipped laboratories. This proved to be a particularly fortunate choice since, not only are results highly reproducible, but preliminary work led to the discovery that functional groups present in a sample may be identified by characteristic constants related to the retention of certain irradiation product peaks called homologous peaks and common peaks, eliminating the need for identification of the decomposition products in evaluating the structure of the sample. In this paper, the procedure is discussed in detail and the decomposition product retention parameters are tabulated for aldehydes, ketones, alcohols, esters, and others. (Authors' abstract)BB

08116

E. J. Thompson, H. J. Coleman, S. L. Hopkins, H. T. Neil

HYDROGENOLYSIS-AN IDENTIFICATION TOOL. J. Gas Chromatog., 5(1):1-10, Jan. 1967. 7 refs.

The development of equipment and techniques that permit application of Sabatier's classical discoveries in vapor-phase hydrogenation to micro samples was accomplished just six years ago in Bartlesville Petroleum Research Center. Since then, many improvements in the procedure have been made. Identifications of sulfur compounds in petroleum, previously thought impossible with the quantities of materials available, are now being made routinely. Many laboratories around the world are using the procedure and modifications thereof. The hydrogenolysis apparatus for structure determination of naturally occurring organic compounds is described. This technique rapidly and quantitatively removes the sulfur atom from organic sulfur compounds to produce paraffins or cycloparaffins. Identification of the produced hydrocarbon identifies or contributes to the identification of the precursor. The technique is direct, applicable to extremely small samples (0.000005 ml), and requires no costly apparatus. The method also has been applied successfully to halogen-, oxygen-, and nitrogen-containing compounds. In addition it has been applied, with success, to the removal of other hetero atoms such as phosphorus, silicon, and metals. Only a few anomalies have beenn found, principally in the deoxygenation reaction. The basic technique, with recent improvements, permits structure characterization that would be difficult or impossible by any other procedure.##

06117

Hausmann, Peter

THE VOLATILITY OF AEROSOLS. Staub (English translation), 27(8):4-5, Aug. 1967. 5 refs.
CFSTI: TT 67-51408/8 (HC $2.00)

Many organic compounds occurring as suspended matter have a volatility (i.e., the maximum possible vapor concentration) which is many times higher than the maximum allowable concentration value. Although these substances occur in the form of suspended matter, it must be taken into account that they may also be present in the form of gas (vapor). This fact is important in the selection of a suitable respirator. It is proposed, therefore, to give in the MAC list, in the case of these substances, the MAC value not only in mg cu m but also in ppm, and to emphasize the necessity of using a combined suspended matter gas filter. (Author's summary, modified)##

06151

Moore, E. E. and D. A. Shytcuk

PHOTO-OXIDATION OF DIETHYL KETONE VAPOR. Can. J. Chem. (Ottawa), Vol. 45, p. 2941-2945, 1967. 9 refs.

Results from studies of the photo-oxidation of diethyl ketone are reported. Quantum yields of the products of the reaction of diethyl ketone when photolysed in the presence of oxygen with light of 3130A were studied as a function of time at 150 and 100 C. The reaction products were mostly the same as those from the photo-oxidation of methyl ethyl ketone. In addition, propionic acid and ethylene were products at 150 and 100 C, while trace amounts of acetone and methyl ethyl ketone were detected at 150 C.

The variety of the reaction products and the absolute values of their quantum yields indicate that the reaction is a complex chain reaction of short length. The primary photolysis split is well established. The chain reaction must be caused by hydrogen abstraction from the ketone molecule by a radical during which two types of 3-pentanonyl radical may be formed.##

06558

Haagen, Walter J.

PHOTOCHEMICAL REACTIVITY OF SOLVENTS. S.A.E. (Soc. Automotive Engrs.), Preprint 670809, 16p., 1967. 5 refs. (Presented at the Aeronautic & Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 2-6, 1967.)

Evaluative studies of relative photochemical reactivities of various organic solvents for purposes of emission control are reported. Solvents include olefins, xylenes and other aromatics of comparable weight, toluene, branched ketones, tri- and tetrachloroethylene; benzene, and saturated halogenated hydrocarbons. Criteria used to judge relative photochemical reactivity were mainly eye irritation and ozone formation. Initial judgments based on these standards were also influenced by aerosol formation, aldehyde production, and effect of test substances on rate of conversion of NO to NO2. The results of the entire study show clearly that xylene is more reactive than toluene and some olefins. However, the latter, as a group, appear to have the greatest photochemical reactivity of all hydrocarbon types. Normal ketones, such as methyl ethyl ketone, are slightly reactive, but branched ketones, such as methyl isobutyl ketone, are somewhat more reactive than their normal isomers. Chlorinated ethylenes, except perchloroethylene, appear to be photochemically active to a degree roughly comparable with branched ketones and toluene. Alcohols and aldehydes are less reactive than toluene; and branched hydrocarbons, cyclic paraffins, and normal paraffins, still less so. Benzene, perchloroethylene, saturated halogenate hydrocarbons and acetone appear virtually unreactive. The results of this study clearly demonstrated that both the quantity of organic solvent emissions in Los Angeles County and their overall photochemical reactivity were such that a reduction was necessary. The results of the studies were utilized to construct Rule 66 for the control of organic solvent emissions in Los Angeles County.

06643

Lichtenstein, Stanley

INSIDE AIR POLLUTION--THE VIEW FROM HBS. Ind. Heating, 34(7):1250, 1252, 1254, 1256, 1260, July 1967. Atmos Air Eng., 9(11):12-15, Nov. 1967.

Investigations by U.S. Bureau of Standards are finding out what happens to estimated total of 140 million tons of pollutants fed into atmosphere annually by motor vehicles, industry, power plants, space heating and refuse disposals. Various methods used in studies of air pollution are discussed. Several scientific teams making important contributions to air pollution are listed.

00827

Wei, Kai, Jean-Claude Rani, and J. N. Pitts, Jr.

THE FORMATION OF POLYENIC DIALDEHYDES IN THE PHOTOOXIDATION OF PURE LIQUID BENZEN. J. Am. Chem. Soc., 89(16):4225-4227, Aug. 2, 1967. 14 refs.

The photooxidation of dry, liquid benzene, has been investigated and among the several products that were formed, two polyenic dialdehydes; trans, trans-2,4-hexadienedial (mucondialdehyde, I) and 2,4,6,8,10-dodecapentaenedial, II, were isolated. Unfiltered radiation from a medium-pressure mercury lamp was used to irradiate at room temperature pure, dry, liquid benzene through which oxygen was continuously bubbled. The irradiated benzene was chromatographed twice on silica gel, giving three fractions. The first fraction eluted with an 80:20 pentane-ether solution, contained mucondialdehyde (I). The second fraction, eluted with a 70:30 pentane-ether solution, contained dialdehyde II. Infrared, ultraviolet, and nmr techniques were used to determine the physical and spectroscopic properties of I and II. Confirmatory evidence was obtained by mass spectrometry and by microhydrogenation which, in the case of II, yielded a product identical with an authentic sample of 1,12-dodecanediol. The physical and spectroscopic properties of the products, specifically infrared spectrum comparisons, confirm the all-trans configurations for both compounds. Results suggest that benzene ring opening by oxygen may also be involved.##

00845

Altshuller, A. P., G. J. Kopczynski, W. A. Lonneman, T. L. Becker, and R. Wilson

PHOTOOXIDATION OF PROPYLENE WITH NITROGEN OXIDE IN THE PRESENCE OF SULFUR DIOXIDE. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((10)]p., ((1967)). 13 refs.

The photooxidation of 2 ppm of propylene and 0.5 ppm of nitrogen oxide was investigated under dynamic flow conditions with sulfur dioxide present in the reaction mixtures at concentrations from 0.0 to 1.2 ppm. Application of the statistical 't' test showed no significant differences in rates of consumption of propylene and nitrogen oxide or in yields of oxidant, peroxyacetyl nitrate, formaldehyde, and acetaldehyde among tests at the various levels of sulfur dioxide, including zero ppm. Amounts of sulfur dioxide consumed in the reactions ranged from 25 to 60%. Although a sulfur balance was not obtained, appreciable amounts of sulfate were measured as a product of the oxidation of the sulfur dioxide. On the basis of previous investigations, the sulfate is believed to be present as sulfuric acid aerosol. These results suggest that appreciable levels of oxidant may occur in urban atmospheres even when high concentrations of sulfur dioxide are present. (Authors' abstract)##

08877

Hess, S. D. and J. N. Pitts, Jr.

STRUCTURE AND REACTIVITY IN THE VAPOR-PHASE PHOTOLYSIS OF KETONES. IV. CYCLOPROPYL AND OLEFINIC CYCLIC KETONES.
J. Am. Chem. Soc., 89(9):1973-1979, April 26, 1967. 32 refs.

Vapor-phase irradiation of bicyclo[3.1.0]hexan-3-one (I) and 3-cyclopentenone (III) at 3130 and 2300-2654 A results in the formation of carbon monoxide and hydrocarbon products with high quantum efficiencies, phi (sub CO) equals 0.77 and 0.87 for I and II, respectively, under a variety of experimental conditions. The hydrocarbon products from I and 1,4-pentadiene (major), vinylcyclopropane, and 1,3-butadiene, while III gives almost exclusively butadiene (phi (sub CO) equals 0.88) over a wide range of temperatures. In contrast, irradiation of bicyclo[3.1.0]hexan-2-one (II) and 2-cyclopentenone (IV) under identical conditions produces only trace amounts of CO and no detectable hydrocarbons. However, compound II does undergo a photoinduced rearrangement to form 3-methyl-2-cyclopentenone. The cyclopropyl and double-bond groups were found to exhibit similar effects on the modes of photoreactivity of these four cyclic ketones. Either of these groups conjugated with the carbonyl chromophore stabilize the ketone, whereas their location in the homoallylic position greatly facilitates photodecomposition. (Authors' abstract)##

09010

R. A. Loutfy, P. Sauvageau, C. Sandorfy

THE ELECTRONIC SPECTRA OF NORMAL PARAFFIN HYDROCARBONS.
Chem. Phys. Letters (Amsterdam), Vol. 1, p. 42-44, March-April 1967. 3 refs.

The far ultraviolet absorption spectra of the normal paraffin hydrocarbons from C1 to C8 were photoelectrically recorded with a double beam instrument down to 1150 A under 0.2 A resolution. An attempt is made to interpret the spectra in terms of Mulliken's united atom treatment of the excited states of methane and ethane. (Authors' abstract)##

09046

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION.
(SEVENTEENTH PROGRESS REPORT: JULY 1 TO DECEMBER 31, 1967.)
Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((65))p., 1967. ((21)) refs.

The modifications in the pressure combustor were found to function satisfactorily and have permitted measurements of both the perturbations in normal stress and the perturbations in total and monochromatic optical intensity. Experimental activities have been limited primarily to obtaining information concerning the perturbations in total and monochromatic optical intensities

utilizing air and natural gas as fuel. Results are presented in several tables. To more fully explain the behavior in the pressure combustor, a set of routine computer programs to permit the prediction of the composition of the products of reaction for any mixtures of air and any hydrocarbon was completed. The calculations have been carried out for varying rates of heat loss from the combustor. The exit temperature from the combustor was computed in this fashion. It was also computed from the rate of flow of gas through the converging-diverging nozzle at the exit of the combustor. Rather good agreement was obtained between these widely different means of evaluating the exit temperature. The complicated behavior of the perturbations in normal stress at the two ends of the combustor is depicted. The behavior depicted can be explained by the difference in temperature at the two ends of the combustor and the markedly greater radial temperature distributions near the exit of the combustor. Furthermore, the velocity of wave propagation is somewhat different at the same point in the combustor depending on the direction of propagation as a result of the local momentum velocity of the gases. A manuscript derived from the work upon the oscillatory combustion in the pressure combustor, has been completely reworked. A significant amount of additional experimental information was included. The revised manuscript which covers all of the experimental work that has been completed with the pressure combustor for the air-natural gas system, is appended.##

09078

Cadle, R. D. and F. E. Grahek

PHOTOCHEMISTRY OF THE SYSTEM KETENE-NO-N2. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967,Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 113-125, Sept. 1967.
CFSTI: PB 176466

Nitric oxide has been found to react rapidly with singlet methylene produced by the photolysis of ketene and possibly also with excited ketene, judging from the ratios ethylene produced/ketene reacted. The presence of nitric oxide prevented the formation of methane and ethane when ketene-NO-N2 mixtures were irradiated at room temperature or 200 C. The products resulting from the presence of nitric oxide were all of low molecular weight, judging from the mass spectra. Eight products were separated using gas chromatography and their mass and infrared spectra determined. Only one, hydrogen cyanide, was definitely identified. (Authors' abstract)

09079

R. F. Preston, R. J. Cvetanovic

THE PHOTOOXIDATION OF BUTENE-1 BY NITROGEN DIOXIDE AT SHORT WAVE-LENGTHS. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 165-192. Sept. 1967. 17 refs.
CFSTI: PB 176466

The photooxidation of butene-1 by nitrogen dioxide has been studied at 2288 A and at longer wavelengths. From the measured effects of additions of inert and other gases on the product yields it is concluded that 1O2 oxygen atoms participate in the photooxidation at 2288 A. Ground state oxygen atoms, produced by the photodissociation of NO2 and possibly by quenching of O(1D) by the olefin, are also important in the photooxidation at 2288 A, and are believed to give rise to practically all of the observed yields of the addition products, n-butanal and 1,2 epoxybutane. The indications are that the reaction of O(1D) with butene-1 at total pressures below one atmosphere yields very little stabilized addition product. (Authors' abstract)##

09080

Peter Borrell, P. Cashmore

THE UNSENSITISED ((SIC)) PHOTOLYSIS OF BUT-1-ENE AT 1849 A. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, Preprints. Max-Plank-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 193-210, Sept. 1967. 16 refs.
CFSTI: PB 176566

On photolysis at 1849 A, but-1-ene yields 25 hydrocarbon products and a solid polymer. In order to elucidate the mechanism, the effects of added gases, time, pressure of reactant gas and temperature were investigated. A free radical mechanism is postulated in which there are six primary reactions to account for the products and their relative yields. The two major primary reactions are cleavage of the C-C and C-H bonds in the beta position to the double bond in a 6:1 ratio. Addition of foreign gases to the system caused a decrease in the product yield which was shown to be due to quenching of the reaction. This is attributed to the collisional deactivation of an excited state intermediate of which the decomposition lifetime has been estimated to lie within the values of 3.5 to 6.4 x 10 to the minus 10th power sec. (Authors' abstract)##

09082

Paul Guppan

SOLVENT AND TEMPERATURE EFFECTS IN THE PHOTOREDUCTION OF KETONES. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part II, Preprints. Max-Plank-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 641-650, Sept. 1967. 15 refs.
CFSTI: PB 176566

The dependence of the quantum yield of photoreduction on solvent polarity and on temperature has been investigated for a number of substituted aromatic ketones. An interpretation in terms of the dipole moments in excited states to account for the solvent effect is discussed. From the temperature effect it is suggested that the different reactivities of n-pi*, pi-pi*, and CT states is related to an activation energy. (Authors' abstract)##

090051

Smith, C. W., C. R. Ablow, G. V. Hanagud, E. R. Spurlock, and D. R. Grine

ULTRASONIC DISSEMINATION OF AEROSOLS. Stanford Research Inst., Menlo Park, Calif., Contract DA-18-035-ARO-122(A), Proj. PAU-6900, Task 1B522101A08101, SRI-TR-9, 67p., July 1967. 9 refs.
CFSTI, DDC: AD 818285

The basic mechanism of sonic aerosol formation was investigated. Aerosol production from a thin liquid layer on a vibrating surface has been known for many years, yet the basic mechanism controlling the drop formation is not known with certainty. Two possibilities are generally suggested. One is that capillary waves, excited on the surface, grow to an unstable size and throw off droplets from the peaks of the waves. The other possibility is the mechanism of cavitation. The theory of a liquid flow over the surface of an oscillating reed was studied to help the understanding of high flow-rate devices. A simple resonance theory has been developed which contrasts with the usual parametric capillary wave theory. An experimental photo-optical technique has been devised and used to give quantitative information on droplet size and velocity distributions. Capillary wave behavior has been examined experimentally and compared with existing theory. A possible explanation of the transition of capillary waves to an aerosol has been suggested. The existance of cavitation during sonic aerosol production from water was verified.

090099

E. C. Hunter, D. Casey

DETERMINATION OF WATER SOLUBLE ADDITIVES IN LIQUID HYDROCARBON FUELS. Australian Defence Scientific Service, Melbourne, Defence Standards Labs., TR-103, 8p., Sept. 1967.
CFSTI, DDC: AD 822971

Ethylene glycol monomethyl ether, with or without glycerol, is currently being used as an additive to inhibit ice formation at low operating temperatures, or microbiological growth at ambient temperatures in liquid hydrocarbon fuels. A simple, efficient testing technique for use in the field to determine additive concentrations in fuel storage tanks has been developed and is based on the determination of refractive index of an aqueous extract. It consists of extracting a measured .80 ml of fuel, in a 100 ml rubber-capped serum bottle, with 1.00 ml of distilled water injected from a calibrated 1 ml hypodermic syringe. After adequate shaking and settling, the aqueous extract is removed, again with a hypodermic syringe, and its refractive index read on a conventional Abbe type refractometer. Under field conditions, tests on samples of known concentration show that results accurate to 0.004% can be easily obtained with concentrations up to 0.20% additive in fuel.##

09116

Horvath, H.

THE REFRACTIVE INDEX OF FREON 12. Appl. Opt., 6(6):1140, June 1967. 2 refs.

The refractive index of Freon 12 (dichlorodifluoromethane) was measured with a Michelson interferometer by counting the fringes during evacuation and refilling the gas cell. The results were reduced to 20 C and 760 mm Hg and can be easily converted to other working conditions. Refractive index has the greatest influence on the scattering coefficient. The amount of scattered light is estimated to be 18.4 times larger for Freon than for air. Using a very sensitive light scattering instrument (integrating nephelometer), the ratio was found to be 15.4 plus or minus 0.7.##

09172

Pejack, Edwin R., and Henry R. Velkoff

EFFECTS OF A TRANSVERSE ELECTRIC FIELD ON THE CHARACTERISTICS AND HEAT TRANSFER OF A DIFFUSION FLAME. Ohio State Univ., Research Foundation, Columbus, Contract DA-11-128-ARO-D-248, Proj. 1860, TR-8, 134p., Nov. 1967. 52 refs.
CFSTI, DDC: AD 664180

Effects of a transverse electric field on a parallel flow diffusion flame in a flat combustion chamber were investigated. Various mixtures of propane, nitrogen, and air were introduced separately at the base of an experimental combustion chamber and burned in a diffusion flame sheet located between flat walls of the chamber which served as anode and cathode. The electrode walls were instrumented to measure the local heat transfer rate, local current density, and pressure. It was found that the application of a voltage difference across the electrodes moved ions out of the burning zone and resulted in a current at the electrode walls. The heat transfer rate near the base of the flame was considerably increased on the cathode and decreased on the anode; at positions further from the base of the flame the electric effect was lessened. Flame distortion was thought to be caused by electrically induced gas motion derived from a gradient in current density in the flow direction and by the onset of an electrically induced flame flickering. An analysis of the products of combustion revealed that the applied electric field acted to increase the amount of unburnt solid carbon and decrease the quantities of unburnt fuel and carbon monoxide. (Authors' abstract)##

09197

W. J. Thomas, E. Duke

KINETICS AND CATALYSIS OF THE REACTION BETWEEN SULPHUR AND HYDROCARBONS. Trans. Inst. Chem. Engrs. (London), 45(3):T119-T127, 1967. 23 refs.

A study of the thermodynamics of the synthesis of carbon disulphide from sulphur and hydrocarbons reveals those conditions which are most favourable for high yields of carbon disulphide without the disadvantages of carbon deposition. Although high molecular weight hydrocarbons should give equilibrium yields of carbon disulphide, some qualitative experiments showed that only the side-chain carbon atoms of aromatic hydrocarbons are active in forming carbon disulphide. Catalyst-activity tests that both silica-gel and vanadium pentoxide are superior catalysts for the formation of carbon disulphide from methane and sulphur. A detailed quantitative kinetic investigation, supplemented by adsorption studies, shows that the formation of carbon disulphide on a sulphided vanadium pentoxide catalyst proceeds via the chemisorption of sulphur, and in this respect differs from the formation of carbon disulphide on a silica-gel catalyst. Although the products retard the reaction rate, the activation energy is lower on the supported vanadium pentoxide catalyst. The advantages of using a vanadium pentoxide catalyst are briefly discussed. A suitable design equation for the rate of formation of carbon disulphide from methane and sulphur over a vanadium pentoxide catalyst is also presented. (Authors' abstract, modified)##

09200

Tipson, R. S., A. Cohen, and A. J. Patiadi

AIR POLLUTION STUDIES. In: Robert Schaffer (ed.), Organic Chemistry, July 1966 through June 1967, National Bureau of Standards, Washington, D. C., NBS-TN-427, 11p., Oct. 1967.

Studies have been conducted on polycyclic aromatic hydrocarbons and certain of their oxidation products. A description is given here of the detection of impurities in commercial preparations of polycyclic aromatic hydrocarbons. The procedures used to purify these preparations are discussed. The presence of an impurity in zone refined anthracene was demonstrated. Upon isolation with the use of thin-layer chromatography, carbazole was found to be an impurity. Upon re-examination by thin-layer chromatography two other impurities were discovered. A dimer of anthracene, 9,9':10,10-bianthracene, was prepared. Its ultraviolet and infrared spectra were recorded. In order to establish specifications of purity for anthracene as a possible standard a comparison was made between three commercial samples of anthracene: high purity, synthetic and zone-refined. It was shown that the synthetic anthracene is the purest of the three samples. Fluorene was similarly studied.##

09267

Doepker, R. D., S. G. Liang, and P. Ausloos

PHOTOLYSIS OF CYCLOPENTANE AT 1470, 1236, AND 1048-1067 A. J. Chem. Phys., 46(11):4380-4386, June 1, 1967. 23 refs.

The photolysis of cyclopentane has been investigated at wavelengths of 1470, 1236, and 1048-1067 angstroms. The primary process, which is the elimination of a hydrogen mole from

cyclopentane, is of major importance at 1470 angstroms but its quantum yield diminishes at shorter wavelengths where processes involving C-C cleavage become more predominant. The products formed in the gas-phase photolysis of cyclo-C5-D10-H2S mixtures and in the solid-phase photolysis of cyclo-C5H10 indicate that the excited cyclopentane molecule undergoes ring opening to form a 1-pentene molecule. In the gas phase, the internally excited 1-pentene decomposes to form methyl and ethyl radicals. At 1048-1067 angstroms, ionization is extensive. On the basis of an isotopic analysis of the propane formed in the photoionization of C5D10-C5H10-O2 mixtures the pattern of the dissociation of the parent ion is determined. Fragmentation of the parent ion diminishes with an increase in pressure. The collisional deactivation process is more pronounced for the perdeuterated than for the perprotonated cyclopentane ion. The data also indicate that a fraction of the parent ions undergoes ring opening to form cis or trans-2pentene as a final product. (Authors' Abstract)**

09700

Henson, B. W. and R. Shaw

KINETICS AND MECHANISM OF HYDROGENOLYSES. THE ADDITION OF HYDROGEN ATOMS TO PROPYLENE, TOLUENE, AND XYLENE. J. Chem. Phys., 47(10):4052-4065 Nov. 15, 1967. 29 refs.

Previously measured rates of hydrogenolysis of propylene, toluene, and xylene all fit, within a power of 10, an empirical equation over an unusually wide range of conditions. The observed fractional -order kinetics require a radical chain mechanism; one is proposed which gives a theoretical rate equation which is in excellent agreement with all reliable data.

09705

Nieville, Rodney L. and Garbis H. Mequerian

MECHANISM OF SULFUR-ALKYLLEAD ANTAGONISM. Ind. Eng. Chem., Prod. Res. Develop., 6(4):253-257, Dec. 1967. 16 refs. 6(4):253-257, Dec. 1967. 16 refs.

Sulfur compounds reduce the antiknock effectiveness of alkyllead by a dual mechanism involving the induced decomposition of alkyllead by thiyl radicals and the deactivation of active Pbo by SO2. With a fuel containing either tetraethyllead or tetramethyllead, octane losses in an engine and reductions in autoignition temperatures in a tubular reactor were determined for thiophene, thiophenol, butyl mercaptan, ethyl sulfide, ethyl disulfide, and di-tert-butyl polysulfide. The two effects correlate directly with each other. Autoignition experiments with an unleaded fuel in a tubular reactor coated with lead oxide showed that reduction in autoignition temperature was caused by SO2 produced by the oxidation of sulfur compounds. However, rates of SO2 production correlate with octane losses only for thiophene, ethyl sulfide, and disulfide. Octane losses caused by mercaptans and the polysulfide are high relative to their ability to induce decomposition of alkyllead at lower temperatures. The initiation of the decomposition is postulated to occur through thiyl radicals

in the liquid phase. Engine results with several fuels containing different sulfur compounds are consistent with the proposed dual mechanism. (Authors' abstract)

09750

Chaudhuri, J., J. Jagur-Grodzinski, and M. Szwarc

ELECTRON AFFINITIES OF AROMATIC HYDROCARBONS IN THE GAS PHASE AND IN SOLUTION. J. Phys. Chem. 71(9):3063-3065, Aug. 1967. 7 refs

Recent studies led to reliable determination of absolute values of electron affinities of aromatic hydrocarbons in the gas phase. The electron affinities were deduced from temperature dependence of the experimentally obtained electron-capture coefficients, K. To obtain a reliable value for electron affinity, K should be determined over a sufficiently wide temperature range within the high-temperature region. The experimental data show that the plots their slopes the values of electron affinity were obtained. The intercepts vary within plus or minus 1 of their mean value, and such variations are plausible because the ratios kl/kD, as well as f(aromatic.-=neg. radical)/f(aromatic) depend on the nature of the aromatic hydrocarbon. These ratios may vary by a factor of 2 or 3 when different aromatic hydrocarbons are compared, leading to uncertainty of more than 1 in the intercept. The assumption of a constant intercept, introduced by previous authors may not be justified. The accuracy of the calculated electron affinity, claimed by the authors and resulting from this assumption, would be f(aromatic) varies by not more than 6 deg. A plot of the change in electron affinities obtained from the present studies vs. electron affinity deduced from studies of previous authors are plotted. The resulting points fit a straight line having a slope of 85 deg., indicating that free energy of solvation of aromatic.-ions (or more correctly the difference in the free energy of solvation of aromatic.- and aromatic) is virtually constant and independent of the nature of the hydrocarbon, at least within the investigated series.

09764

Aitken, Philip L. and Dorothy S. Dittmer (comps. and eds.)

ATMOSPHERE AND POLLUTANTS. (CHAPTER V.) In: Environmental Biology, Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio, Contract AF33(615)-2252; NIH-GM-06553, NASA-NASr-238, Proj. 7184, Task 718406, AMRL-TR-66-190, p. 269-329, Nov. 1966. (300) refs.

Numerical data on air pollutants are compiled and tabulated for a broad range of problems. The effects of pollutants on human health, plants and livestock are presented. Characteristics and chemical composition of the atmosphere and its pollutants are compiled. Data on emission sources of pollutants and their distribution at various periods of time in different locales are presented. Other categories covered are air dispersion of small organisms, biological effects of gaseous ions, and spacecraft and nuclear submarine atmospheres.

10028

Lassetar, J. L.; J. Weete, and D. J. Weber

ALKANES, FATTY ACID METHYL ESTERS, AND FREE FATTY ACIDS IN SURFACE WAX OF USTILAGO MAYDIS. Phytochemistry, Vol.7, p.001-005, 1968. refs.

The wax fraction from chlamdospores of Ustilago maydis (Basidiomycetes) were analyzed by gas chromatography and mass spectrometry combination. The hydrocarbon fraction contained predominantly C25, C27, and C29 n-alkanes. A second fraction eluted from a silica gel column contained natural methyl esters of both saturated acids with predominant esters being from C16 through C20. The methyl esters of C18 mono and dibasic fatty acids were present i abundance. The free fatty acid fraction contained fatty acids ranging in carbon number from C12 through C20. In both the free acid and natural methyl esters the distribution of carbon skeletons were similar with the predominant compounds having even carbon number chains. (Authors' abstract)

10039

Sternberg, H.W.; C.L. Delle Donne, and I. Wender

SIMILARITY BETWEEN THE ELECTROCHEMICAL ELIMINATION OF SULPHUR FROM COAL AND FROM DIBENZOTHIOPHENE. Fuel, 47(3):219-232, May 1968. 9 refs.

When dibenzothiophene was reduced electrochemical under the same conditions as coal, sulphur was eliminated only after four hydrogen atoms had been added to the dibenzothiophene ring. A similar patter of sulphur removal had been observed previously during the electrochemical reduction of coal where sulphur was eliminated only after 25 hydrogen atoms per 100 carbon atoms had been added to the coal. The hypothesis is that the first step in the electrochemical reduction of dibenzothiophene is addition of hydrogen to the aromati ring. No carbon-sulphur bonds are broken and no sulphur is eliminated until partial hydrogenation of the aromatic ring has take place.

10041

Goetz, Alexander and Sigiard J. Riojnot

TRANSFORMATION OF GASEOUS REACTIVE HYDROCARBONS INTO AEROCOLLOIDS ULTRAVIOLET IRRADIATION. J. Air Pollution Control Assoc., 17 (9):600-603, Sept. 1967.

A substantial variety of hydrocarbons, particularly the reactive types, can be converted from the gaseous into the aerocolloidal stat by brief exposure to UV-irradiation. The procedure for evaluating the capacity of various hydrocarbons to form aerocolloids, and thus to define the difference between non-reactive and reactive types, is illustrated. Two sensoring devices were utilized; an aerosol photometer and a moving slide inspector. A summary includes these observations: the aerocolloid formation by ultraviolet exposure is due to intermediate oxidation states of the molecules with a high

tendency to polymerize into sub micron particulates. High humidity levels increase the reaction rate and thus the aerosol formation. The characteristic difference between saturated and unsaturated HC types is the much lesser PM-reactivity of the former. This method permits the tracing of organic components in the open atmosphere. It promises to facilitate the simple and rapid discrimination between the neutral and potentially reactive HC types.

10085

Hometh, Andreas and Robert F. Sawyer

THE OVERALL KINETICS OF HIGH TEMPERATURE METHANE OXIDATION IN A FLOW REACTOR. California Univ., Berkeley, Division of Thermal Systems, 68-3, 20p., (1968). 20 refs.

The rate of methane consumption in an oxidation reaction was measured in a non-isothermal flow reactor in the temperature range o 1100-1202 deg. K. The reaction was monitored by mass spectrometric analysis. The following overall rate expression was found valid, however, only for temperatures greater than 1200 deg. K. The result is in reasonable agreement with data measured by another method in the high temperature range. (Authors' abstract modified)

10119

Lancaster, J. L., D. L. Weber, H. Schneider, and J. Oro

STUDIES ON THE INCORPORATION OF ACETATE-1-14C AND STEARATE-UL-14C INTO THE HYDROCARBONS OF CHLORELLA PYRENOIDOSA. Houston Univ., Tex. Dept. of Biology and Biophysical Sciences, 10p., April Dept. of Biology and Biophysical Sciences, 10 p., April 8, 1968. 10 8, 1968. 1 refs.

Both labelled acetate and stearate were found to serve as precursors for the formation of hydrocarbons in Chlorella pyrenoidosa. Acetate incorporation was inhibited in the dark. Of particular interest was the observation that the carbon skeleton of stearic acid could be converted into heptadecane but not into the predominant monounsaturated C17 hydrocarbon. This study presents th first evidence that straight- chain fatty acids serve as precursors for short-chain saturated hydrocarbons. (Authors' abstract)

10129

Hunn, R. W., Basil Dimitriadon, and R. D. Fleming

EFFECT OF HYDROCARBON TYPE OF REACTIVITY OF EXHAUST GASES. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vo., 12, New York, Society of Automotive Engineers, Inc., 1968, p. 1-9. 6 refs. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 1965.)

Unburned hydrocarbons and other products of combustion are recognized as contributors to photochemical air pollution. The work reported here was a first approach in finding an expression of exhaust gas quality--or compositional characteristic--that

would associate directly with the photochemical activity of the composite sample. Olefins, aromatics, and partial oxidation products have been cited as the principal smog precursors in exhaust gas. However, results of this study indicate that for the general case, collective determination of these classes provides and unreliable indication of reactivity. The findings are expected to be useful in further development of methods to measure -- or predict -- the air polluting potential of exhaust gas with increased reliability. (Authors abstract)

10512

Simonaitis, R. and J. N. Pitts, Jr.

PHOTOCHEMISTRY OF GAMA-BUTYROLACTONE IN THE LIQUID PHASE. Preprint California Univ., Riverside, Dept. of Chemistry, 18p., (1965/)

The photolysis of gama-butyrolactone was investigated in the liquid phase with the 2537A line of a mercury resonance lamp. The major products were allylformate, succinaldehyde, cyclopropane, and carbon dioxide with quantum yields at 25 deg. C of the 0.23, 0.06, 0.013 and 0.015, respectively. From product quenching data, it is suggested that triplet-triplet energy transfer from gama butyrolactone to cis-butene, transbutene, cyclohexene and biacetyl occurs at a diffusion controlled rate and that the allylformate and cyclopropane originate from one state, probably a triplet, but that succinaldehyde originates from a different state. Added isopropyl alcohol quenched the formation of allylformate and cyclopropane, but acetonitrile as a solvent had no effect on their yields over the concentration range of 0.3-18.0 moles/liter. An increase in temperature from 25 deg. C to 98 deg. C increased the yields of succinaldehyde and cyclopropane and decreased the yield of allylformate, but the sum of the quantum yields of these products remained relatively constant. (Authors' abstract)

10513

Cowell, Gavin W. and James N. Pitts, Jr.

PHOTOCHEMICAL STUDIES IN RIGID MATRICES. II. A STUDY OF THE PHOTOCHEMICAL REACTIVITY OF ANTHRACENE IN POLYSTYRENE AND THE DEVELOPMENT OF AN O-NITROBENZALDEHYDE ACTINOMETER IN POLYMETHYLMETHACRYLATE. Preprint, California Univ., Riverside, Dept. of Chemistry, (79)p., (1967/).

The photochemistry of o-nitrobenzaldehyde and anthracene in rigid polymer films has been studied at 25 deg. and 1190 and 3660A. o Nitrobenzaldehyde 'dispersed' in polymethylmethacrylate, M.W. < 20,000 plus or minus 3,000, undergoes the well known photo isomerization to o-nitrosobenzoic, the quantum yield being 0.05 plus or minus 0.05. Within experimental error, this is the same as in fluid solutions and in the pure solid. In view of the stability and convenience of this system, its use as an actinometer in the spectra region 2800-4100A is envisaged. Anthracene 'dispersed' in polystyrene, M.W. < 47,000 plus or minus 4,000, undergoes photodimerization at a rate much reduced from that in fluid solution or in a potassium bromide pellet. The nature of the 'dispersion' of the anthracene in the film differs significantly from its state in

potassium bromide matrices. In the presence of oxygen, the major part of the photochemical reaction leads to the formation of the photoxide of anthracene. Kinetic and mechanistic details are discussed. (Authors' abstract)

10929

Mainster, M. A. and J. D. Memory

SUPERDELOCALIZABILITY INDICES AND THE PULLMAN THEORY OF CHEMICAL CARCINOGENESIS. Biochim. Biophys. Acta, Vol. 148(3):605-608, 1967 6 refs.

Alternative electronic indicies, based upon the use of superdelocalizability as a measure of reactivity, are used to obtain an alternative formulation of the Pullman theory of chemical carcinogenesis. Although the alternative formulation of the Pullman theory of chemical carcinogenesis does not offer improved correspondence with experimental results, it is of interest for several reasons. The success of the superdelocalizability criteria demonstrates that at least one index of reactivity other than localization energy may be used to characterize molecular carcinogenicity accurately. The reformulation successfully incorporates the description of the reactivity of a region in terms of single atom parameters only, and permits greater computational ease for potential extensions to substituted hydrocarbons, because only the fundamental molecular framework must be considered, whereas a calculation of the complex localization energy indices usually involves seven different structures. Furthermore, criteria can be expressed explicitly in terms of molecular orbital coefficients and energies. Since many experimental spectroscopic parameters may be described theoretically by molecular orbital methods, this characterization suggest that correlation of carcinogenicity with these experimental quantities may be possible.

11050

E. H. Stephens

CHEMISTRY OF ATMOSPHERIC OXIDANTS. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 12p., 1968. 15 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minnesota, June 23-27, 1968, Paper 68-57.)

All of the important oxidants in polluted air are formed there by chemical reactions which occur among the primary pollutants. The most abundant of these oxidants is ozone which is formed in a cycle involving nitric oxide, nitrogen dioxide, atmospheric oxygen, and hydrocarbons. This ozone is best understood, not as a reaction product, but as an intermediate in steady state concentration between formation and disappearance reactions. Hydrocarbons permit accumulation of ozone by reacting to scavenge the nitric oxide which would otherwise remove the ozone. The amount of ozone which can be formed in ambient polluted air is limited to about one ppm because these scavenging reactions become less effective when the nitric oxide concentration becomes very small. The peroxyacl nitrates are a group of oxidants which result from reactions between oxides of nitrogen and organic pollutants. Olefinic and aromatic hydrocarbons make

the largest contribution to PAH formation; saturates contribute little if any. the role of nitrogen dioxide and other oxidizing agents is also discussed. (Author's abstract)##

11097

Crider, Walter L.

HYDROGEN-AIR FLAME CHEMILUMINESCENCE OF SOME ORGANIC HALIDES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Association, ((17))p., ((1968)). 8 refs.

The effects of hydrogen and air flow rates on the flame chemiluminescent spectra emitted by some organic halides are illustrated. Flame chemiluminescent spectra of an organic phosphite and an organic sulfide over the same range of burner operating modes are presented for comparison. Detection limits of halide vapors in air were found to be 0.01 ppm (v/v) for CH3I, 0.03 ppm for Br(CZH5)Br, 1.5 ppm for CHCl3 and CCl4, and 3.0 ppm for CH2Cl2 and Cl(CZH4)Cl. (Author's abstract)##

11147

Fatiadu, A. J.

PERIODIC ACID, A NOVEL OXIDANT OF POLYCYCLIC, AROMATIC HYDROCARBONS. J. Res. Nat. Bur. Std. A, 72A(4):341-350, July-Aug. 1968.

Certain polycyclic, aromatic hydrocarbons can be oxidized with periodic acid in aprotic solvents containing a small proportion of water. A unique, two-fold character of response to periodic acid by these hydrocarbons has been found: (1) production of a coupling reaction through a radical intermediate ((conversion of pyrene into 1,1'-bipyrene, and fluorene into 1,2-bis (2,2'-biphenylylene ethylene)) or (2) conversion into quinones by a two-equivalent oxidation mechanism that does not involve a radical intermediate (acenaphthenone anthracene, anthrone, benz((a)) anthracene, naphthalene, and phenanthrene)). Little or no reaction was observed when oxidation was attempted with sodium metaperiodate instead of periodic acid. Electron-spin resonance revealed no radical intermediate in the oxidation of malonic acid with either periodic acid or sodium periodate. (Author's abstract)

11168

Wagner, H. W., and J. B. Novak

STUDIES OF RADIATIONLESS TRANSITIONS IN CORONENE USING NANOSECOND LASER PHOTOLYSIS AND SPECTROSCOPY. Preprint, TRW Systems, Redondo Beach, Calif. Chemical Sciences Dept.,(16)p., 1968. 20 refs. (Presented at the International Conference on Molecular Luminescence Loyola Univ., Chicago, Ill.,Aug. 20-23,1968.)
CFSTI: AD 672997

We have used the technique of nanosecond laser photolysis and spectros g spectroscopy to observe absorption from both the lowest excited singlet state S1, and the lowest triplet state T1, of coronene. The technique employs a Q-switched ruby laser to produce both a 30 nsec pulse at 347 ns for excitation, plus, at the same time, a laser-induced spark which provides a background continuum for absorption spectroscopy. Time-resolved spectra are obtained with an image converter camera. We have observed new transient absorption bands for coronene at 520 and 380 ns and attribute these to absorption by the S1 state. The new bands locate previously unobserved higher singlet level of g parity. These bands decay over a period of several hundred nanoseconds and are concomitantly replaced by absorption bands characteristic of the lowest triplet state, thus providing a pictorial record of the process of intersystem crossing. We have also obtained the T-T absorption spectrum of coronene in epoxy plastic out to 1.19 microns using a double-beam cross-irradiation technique. New maxima in the infrared serve to locate th energies of three low-lying excited triple levels. From the energy level data we believe that in coronene intersystem crossing from higher singlet states to the triplet manifold may occur. We discuss how our kinetic observations of the decay of the lowest excited singlet and the build-up of the lowest triplet state bear on a recently proposed stationary state model of radiationless transitions. (Authors' abstract)

11210

Miller, William J.

FLAME IONIZATION AND COMBUSTION INHIBITION. (TECHNICAL REPORT NO. 1.) Aerochem Research Labs,# Inc., Princeton, N.J. CST-102, PP-151, 23p., Jan. 1967. 17 refs.

The inhibition of spherically symmetrical low-pressure CH4 or C2H2/O2 diffusion flames by a variety of additives has been studied. The relative efficiencies of the compounds studied have been found to be very nearly the same as in 1-atm flames. A detailed examination of the effects of CCl4, Fe(CO)5, and Cr(C6H6)2 upon ion content and emission spectra has been made and the results interpreted in terms of previously postulated correlations between the ability of a given compound to reduce electron concentrations and its effectiveness as a flame inhibitor. No such correlation was found to exist and it has been concluded that for these flames no causal relationship exists between the two phenomena. The relatively large inhibition efficiencies of Fe(CO)5 and Cr(C6H6)2 are attributed to in situ ultrafine particle formation downstream of the flame front and their subsequent diffusion into the reaction zone. The formation of these particles is indicated by ion profiles of nucleating species; the presence of the particles in the reaction zones of inhibited flames is further evidenced by the emission of continuum radiation. The dominance of diffusional over convective mass transport is the characteristic of the system which accounts for its susceptibility inhibition by these compounds. (Author's summary) GS

11239

S. Sunan, D. H. Slater, and J. G. Calvert

THE PHOTOCHEMISTRY OF THE ALDOALKANES. Preprint, Ohio State Univ., Columbus, Evans Chemical Lab., ((29))p., ((1968)). ((34)) refs.

The photochemistry of the aldoalkanes has been the subject of many studies in several laboratories. The major interest developed because of their attractiveness as free radical sources. The first absorption band lies in the accessible near ultraviolet, and in the gas phases a large fraction of the light-absorbing molecules decompose to form free radicals. In the gas phase photolysis of aldoalkanes of higher complexity, a significant fraction of the light-excited molecules do not decompose, but are stabilized by a second order kinetic process which is often termed "collisional deactivation". A description of the photochemistry of 1, 1'-azoisobutane is given. A kinetic study of the products of the gas phase photolysis of 1,1'azoisobutane is presented.##

11240

David H. Slater, and Jack G. Calvert

THE PHOTOOXIDATION OF 1,1'-AZOISOBUTANE: THE REACTIONS OF THE ISOBUTYL FREE RADICAL WITH OXYGEN. Preprint, ((19)) p., 1967. (Presented at the International Oxidation Symposium, San Francisco, Calif., Aug. 29, 1967.)

A study has been made of the photooxidation of 1,1'azoisobutane in experiments at 3660 A and full mercury arc and at temperatures from 308 to 405 degrees K. The data prove the unimportance of energy transfer and singlet oxygen involvement for this system. The rates of products and their quantum yields are consistent with a mechanism involving the reactions of the isobutyl free radical with oxygen. The product distributions suggests that the isobutylperoxyl and/or isobutoxyl free radicals are unstable toward a decomposition reaction even at 308 degrees K for our conditions. (Authors' abstract)##

11541

DeGrazia, Robert P. and Robert O. Auge

EVALUATION OF A GAS MIXING SYSTEM. Dow Chemical Co., Denver, Colo., Rocky Flats Div., Contract AT(29-1)-1106, RFP-1143, 7p., May 1968.
(CFSTI: RFP-1143)

Because of the need to obtain standard gas mixtures in concentrations ranging from parts per million to percent for infrared and gas chromatographic analysis, a gas mixing apparatus was developed. To evaluate its capability, the apparatus was used to prepare mixtures of different concentrations of gases. The mixed gases were analyzed by gas chromatography and infrared spectroscopy. The results of the analyses of the prepared mixtures were then compared statistically with standard mixtures of the

some gases obtained commercially. The comparison of these analyses showed that the apparatus can effectively and reproducibly prepare gas mixtures over the ranges studied. The apparatus is described and the precision and accuracy data are presented. (Authors' abstract)##

11571

Kutscher, W., H. Tomingas and H. F. Weisfeld

STUDY OF THE HAZARDS PRESENTED BY SOOT AND AIR DUST WITH PARTICULAR EMPHASIS ON THEIR CARCINOGENIC ACTION. PART 9 - SEPARATION OF 3,4-BENZOPYRENE FOLLOWING SOOT INHALATION IN THE LUNG OF LIVE RATS. ((Untersuchungen uber die Schadlichkeit von Russen und Luftstauben unter besonderer Berucksichtigung ihrer kanzerogenen Wirkung.)) Text in German. Arch. Hyg. Bakteriol., 152(3):258-288, June 1968. 9 refs.

The separation of benzopyrene from soot was investigated in the lung of rats, following inhalation or tracheal injection of soot suspensions. Isolated benzopyrene was found in the rat lung 4 hours following soot inhalation. Benzopyrene separated from soot was found in rat lung tissue 3 hours following tracheal injection. Isolated carcinogen was no longer present in the lung at the end of 15 hours, but the lung soot still contained benzopyrene 4 months following treatment.##

12058

Quincja, F. C.

COMBUSTION STUDIES OF OLEFINS AND OF THEIR INFLUENCE ON HYDROCARBON COMBUSTION PROCESSES. Combustion Flame, 12(5):401-410, Oct. 1968. 21 Ref.

Comparative studies of the pre-flame and ignition behaviours of ethylene, propene, but-1-ene, cis-but-2-ene, trans-but-2-ene, isobutene, hex-1-ene and hexa-1,5-diene have been made. Moreover, the effect of all these olefins on the combustion of hexane at different oxidation stages leading to ignition has been studied. The observed relative order of ease of combustion of some of the olefins is different from that observed in laboratory studies by other workers but agrees with the relative order of knocking tendencies in engines. It is shown that, in general, olefins are less prone to oxidative degradation than the conjugate alkanes, and not vice versa as has been presumed recently in proposals for a new mechanism for the combustion of hydrocarbons. All the olefins studied markedly affect the combustion of hexane from the earliest stage of its oxidation. The earliest pre-flame stage is inhibited while the final stage leading to ignition is promoted. The nature of the effect on the intervening stages, varies widely, however, ethylene and isobutene inhibit, while hex-1-ene, hexa-1,5-diene and but-2-enes promote; propane and but-1-ene have a negligible effect. The results facilitate understanding of the mechanism of combustion of olefins and of their role as intermediates in the combustion of hydrocarbons in general. Mechanisms are proposed to explain the various observations. Author's Abstract##

12169

J. N. Pitts, Jr.; and J. K. S. Wan

THE PHOTOCHEMISTRY OF KETONES AND ALDEHYDES. Preprint, California Univ., Riverside, Dept. of Chemistry, 101p., Dec., 1969. 272 refs.

With the development of modern experimental techniques, particularly in analysis of complex mixtures by liquid-gas chromatographic methods, photochemistry has assumed an increasing importance in studies of free radical reactions, energy transfer processes and the synthesis of new and unique organic compounds. Perhaps the most widely studied class of compounds, historically and today, is that containing the carbonyl chromophore. The absorption spectra of most carbonyl compounds fall in the experimentally readily accessible region of the ultraviolet where quartz has high transmission and mercury arcs produce strong line emission spectra. In order to obtain a thorough understanding of the photochemistry of a given system, one must elucidate the entire "life history" of the photoprocess; this includes the primary process (es) and all secondary reactions in the system.##

12172

Willis G. Perkins, and Elmer L. Miller

ROLE OF THE CATALYST IN THE REACTION OF ALCOHOLS AND HYDROGEN SULFIDE. Preprint, 9p., 1962. 15 refs. (Presented at the Session on Processes during the 27th Midyear Meeting of the American Petroleum Institute's Div. of Refining, in the Fairmont Hotel, San Francisco, Calif., May 15, 1962.)

The main products formed in the high-temperature catalytic reactions of aliphatic alcohols and hydrogen sulfide are the corresponding mercaptans and sulfides. Minor amounts of other compounds such as ethers, aldehydes, and olefins are also produced. The reaction can be controlled to produce either mercaptan or sulfide by judicious choice of catalyst composition. Operating conditions play an important but secondary role in product distribution. Catalysts including alkali metal salts and oxides incorporated with activated alumina and similar supports promote mercaptan formation almost exclusively, whereas acidic-type catalysts favor sulfides as the product. The effects of general composition, promoter concentration, and the nature of the catalyst support upon activity and selectivity are discussed for reactant alcohols from methanol through octanol. Processes for both mercaptan and sulfide production have resulted from these catalyst studies. (Authors' abstract)##

12949

Ueda, Keiten

POLLUTED AIR PRODUCTION WITH GASEOUS PARTICLES. (Gasuju no ensenbutsu ni yoru ogen-kuki sakuseiho). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 6(7):10-17, 1969. 17 refs.

Special techniques have been devised using scattering cells, permeation tubes, or multiple step dilution to obtain a reproducible contaminated atmosphere. Artificially polluted air is used not only in the evaluation of a high efficiency air filter, but also in the experimental analysis of harmful effects on animals. Different gas particles are used and gas concentrations are also varied for different experiments. For example, CS2 (0.1 ppm) and C6H6 (1 ppm) are used for animal inhalation experiments and hydrocarbons (100 ppm), SO2 (10 ppm), and nitrogen oxides (10 ppm) are used for the measurement of collection ratios of high efficiency air filters. To perform these experiments and measurements correctly, purity, concentration, temperature, and pressure of the polluted gas should be stable.

13034

Weaver, E.E., J.S. Hinonlya, L.H. Skewes, and C.H. Ruof

OXIDATION OF GASEOUS HYDROCARBONS IN CONCENTRATIONS OF PARTS PER MILLION IN FLOW SYSTEMS. OXIDATION OF 1-BUTENE IN TYPE 410 STAINLESS STEEL TUBES. Environ. Sci. Technol., 3(1):57-62, Jan. 1969. 6 refs.

1-Butene was oxidized in concentrations of 7 to 350 ppm in 90% nitrogen-10% oxygen blends flowing laminarly in fresh and aged Type 410 stainless steel tubes with residence times of 0.10 to 0.25 sec at temperatures between 550 and 800 C. In the fresh tubes, the reaction appears to be largely homogeneous, since nearly identical oxidation rates are obtained in tubes of different diameters and hence of different surface-volume ratios. However, on prolonged use the tubes become increasingly catalytic, showing an order of magnitude increase in rates of oxidation; simultaneously, the surface area of the tube increases by an order of magnitude as shown by BET measurements. The rates of disappearance of the 1-butene approach first-order with respect to hydrocarbon concentration as the tubes are aged; they become independent of oxygen concentration when about 20 times the stoichiometric amount of oxygen is present. (Author abstract modified)

13063

Carmon, John F. and Francis F. Wong

SEPARATION OF ALIPHATIC DISULFIDES AND TRISULFIDES BY GAS-LIQUID PARTITION CHROMATOGRAPHY. J. Org. Chem., 24(2):175-179, Feb. 1959. 17 refs.

The application of gas-liquid partition chromatography to the separation and isolation of some aliphatic disulfides and trisulfides is discussed in connection with a study of the volatile components of onions. The polar phases, Carbowax and Reoplex, and a nonpolar phase, Apiezon M, were compared in the separation. It was found that mixtures of disulfides and trisulfides can be separated at 150 C without serious decomposition. No exchange reactions occurred between mercaptans, disulfides, and trisulfides, and allylic disulfides were

separated without the formation of monosulfides. Absence of decomposition during chromatographic separation was confirmed by infrared analysis of collected fractions. The polar phases were particularly useful for separating unsaturated disulfides from the corresponding saturated compounds.

19678

Beytia, Enrique, Pablo Valenzuela, and Osvaldo Cori

TERPENE BIOSYNTHESIS: FORMATION OF NEROL, GERANIOL, AND OTHER PRENOLS BY AN ENZYME SYSTEM FROM PINUS RADIATA SEEDLINGS. Arch. Biochem. Biophys., 129(1):346-356, Jan. 1969. 37 refs.

The properties of a soluble enzyme system obtained from Pinus radiata seedlings, which transforms 2-C-14-mevalonic acid (MVA) into C5 and C10 alcohols, were studied. The system incorporated 6 to 7% of the radioactivity from MVA into isopentenol, dimethyl allyl alcohol, nerol, and geraniol and required Mg(2+) or Mn(2+) and SH groups for optimal activity. Five and ten-carbon prenols are formed from the corresponding phosphorylated derivatives by a phosphatase, which may be partially inhibited by NaF. About 1% of the radioactivity from MVA remains bound to the proteins in an apparently non-covalent association. This radioactivity, which behaves mainly as C15 prenols, may be related to the biosynthesis of carotenes or phytol, and not to monoterpenes. It can be extracted with 1-butanol. The identification of C-14-isopentenol in a hexane-soluble fraction, after incubation of the enzyme system with MVA, suggests that isopentenyl pyrophosphate (IPP) is hydrolysed by an acid phosphatase. Dimethyl allyl alcohol, identified in the same fraction, is probably formed by enzyme hydrolysis of dimethyl allyl pyrophosphate (DMAPP). The sensitivity of the enzyme system forming allylic phosphates also suggests the isomerization of IPP to DMAPP. Formation of geraniol and geranyl pyrophosphate (GPP) is probably related to the biosynthesis of diterpenes, carotenes, and phytol. There is no evidence that GPP is the precursor of monoterpenes.

19678

Behrendt, H. E., H. L. Chasen, and J. H. Li

2-CHLORO-5-CYANO-3,6-DIHYDROXYBENZOQUINONE, A NEW ANALYTICAL REAGENT FOR THE SPECTROPHOTOMETRIC DETERMINATION OF CALCIUM (II). Anal Chem., 38(8):1018-1019, July 1966. 8 refs.

A new analytical reagent, 2-chloro-5-cyano-3,6-dihydroxybenzoquinone (HCDBQ), for the spectrophotometric determination of calcium is described. The reagent is the product of the decomposition of 2,3-dichloro-5,6-dicyanobenzoquinone (DDQ) by water. Its disodium salt was prepared from DDQ. Experiments to study the nature of disodium HCDBQ solution and complexes revealed that dilutions of the solutions followed Beer's law, and that the precipitations varied in color and structure. A series of disodium HCDBQ and Ca(NO3)2

solutions were prepared and a linear plot was obtained for the calibration curve for the HDEQ supernatant solutions of the Ca complex. The sensitivity of the determination was found to decrease when the pH was less than four. Spectrophotometric analyses were performed on several aquaria water samples.

13368

Garibyan, T. A., A. A. Mantashyan, and A. B. Nalbandyan

FORMATION OF PEROXIDE RADICALS DURING PHOTOCHEMICAL OXIDATION OF HYDROCARBONS. (K obrazovaniyu peroksinykh radikalov pri fotokhimicheskom okislenii uglevodorodov). Text in Russian. Army Khim. Zh. (Erevan), 22(6):385-387, 1969. 3 refs.

A previously described apparatus for electron paramagnetic resonance determination of radicals formed from hydrocarbons was modified to determine whether the peroxide radical was formed from the free alkyl radical according to the equation R plus O2 yields RO2 or heterogeneously on the cold surface. It was shown that the peroxide radicals were formed just in the zone of the gas phase reaction.

13391

Aarvik, Jon

CATALYST FOR THE REACTION BETWEEN HYDROCARBONS AND SULFUR DIOXIDE FOR THE PREPARATION OF PURE SULFUR. (Norg. Geol. Undersoekelse Trondheim, Norway) U. S. Pat. 3,369,872. 1p., Feb. 20, 1968. 3 refs. (Appl. Aug. 10, 1965, 1 claim.)

Carbon formation can essentially be eliminated in the reduction of sulfur dioxide with hydrocarbons such as mineral oil by the use of a cordierite catalyst or other material with uniformly sized pore of molecular dimensions. Sulfur dioxide is contacted with the mineral oil and catalyst at 800 to 1300 C to produce sulfur and reaction gases free of carbon. Sulfur dioxide and H2S occur in a 1:2 ratio. The SO2 and H2S may be reacted to form more sulfur.

13453

Crowell, E. P. and B. B. Burnett

MICRO DETERMINATION OF ROSIN AND FATTY ACIDS IN TALL OIL. TAPPI, 49(7):327-328, July 1966. 8 refs. (Presented at the 51st Annual Meeting of the Technical Association of the Pulp and Paper Industry, held in New York, N. Y., Feb. 20-24, 1966.)

The standard procedure for the determination of total rosin acids and acid number, ASTM D-803, requires 9 g of sample for single determinations. Therefore, it is not applicable to situations were large quantities of tall oil are not available. Such is the case with samples of crude tall oil from black liquor streams of the kraft pulping process. The boron trifluoride-methanol esterification procedure for selectivity masking fatty acids in the rosin acid determination was investigated and found to be

attractive because it is simple to use and has proven applicability to small samples. Gas chromatographic investigation showed that this methylation procedure is selective for fatty acids and is therefore acceptable for this purpose. The minimum sample requirement for the determination of both fatty and resin acid is 75 mg of tall oil. Acceptable agreement between the ASTM procedure and this micro method was observed for samples with greater than 15% resin acids. (Authors' abstract)

13465

Nicke, Alfred F., Henry E. McLaughlin, and Joseph H. Stump, Jr.

PROCESSES FOR REMOVING STILBENE FROM TALL OIL FATTY ACIDS. (Tennessee Chemicals, Inc., Delaware) U. S. Pat. 3,257,438. 4p., June 21, 1966. 11 refs. (Appl. May 18, 1962, 5 claims.)

The process utilizes catalytic amounts of boron trifluoride to convert a major portion of the stilbene compounds in tall oil fatty acids to higher-boiling derivatives. The catalyst is removed and the treated fatty acids are distilled. The reactions occur readily at room temperature, but the process is successful up to 100 C. Tall oil fatty acids containing 0.1% or more stilbene can be treated to obtain a product containing less than 0.04% stilbene.

13494

Royden, I. G. C.

CHEMICAL CONSTITUTION AND REACTIONS OF COAL. In: Chemistry of Coal Utilization, Supplementary Volume, H. H. Lowry (ed.); National Academy of Sciences, Washington, D. C.; Committee on Chemistry of Coal, p. 212-295, 1963. 393 refs.

Various methods of determining the chemical composition of coal are surveyed. Solvent extraction yields little information about the coal molecule, apart from a molecular weight distribution. If solvent extracts contain more than 7 to 8% of the parent coal, they resemble it closely, provided they are prepared below 250 C. If prepared above this temperature, pyrolysis has clearly modified their composition. The best specific solvents for coal contain a nitrogen atom with a readily available pair of electrons. Evidence from polarography has suggested that certain nuclei containing one, two, and three rings play an important part in coal structure. X-ray histograms suggest that about one-half of the carbon in the nuclei is almost equally distributed between one, two, and three rings, but these estimates may be biased toward the larger ring systems. In the polarography of coal extracts, the frequent occurrence of half-wave potentials, for the reduction of aromatic systems, points to the presence of a considerable proportion of biphenyl, naphthalene, phenanthrene, and triphenylene structures. The extent of reduction suggests a minimum polycyclic aromaticity between 0.35 and 0.5. Methods of functional group analysis and polarography at lower potentials have shown that the hydroxyl and carbonyl group concentrations account for 70 to 90% of the O2 in bituminous coal. Hydrogenation, extensive oxidation, hydrolysis, pyrolysis, and fluorination are the most interesting reactions of coal, but furnish only limited information about the structure of coal itself.

13499

Bagliano, G. and L. Cantelmi

THE ADSORPTION OF METAL IONS FROM HF-HCl04 MIXTURES ON SOME ION EXCHANGE PAPERS. J. Chromatog., 21(3):499-502, March 1966. 2 refs.

A comparison of ion exchange from HF-HCl and HF-HCl04 mixtures for ions known to adsorb from these solutions is made using two types of anion and one cation exchange paper. The concentration of HCl or HCl04 was maintained constant at 1N and the HF concentration was varied from 1 to 10N. Experimental results show that, while there are considerable differences in adsorption from HF-HCl, very few ions were adsorbed from HF-HCl04. Tantalum may be adsorbed from mixtures with Hf, Zr, Ti, Nb, Mo, W, and U on an anion exchange resin paper from HF-HCl04.

13505

Barton, Joseph

DETERMINATION OF LIGNIN IN SMALL PULP AND PAPER SAMPLES USING THE ACETYL BROMIDE METHOD. TAPPI, 50(7):335-337, July 1967. 10 refs. (Presented in part at the 51st Annual Meeting, Tech. Assoc. of the Pulp and Paper Industry, New York, Feb. 20-24, 1966.)

The acetyl bromide method of determining lignin in wood was extended to determine lignin in unbleached softwood pulps. Small (5-10 mg) pulp and uncoated paper samples are dissolved in an acetyl bromide-acetic acid mixture. The absorbance of the solutions at 280 nm is related to the absorptivity of reference lignin preparations. The calculated lignin content correlates excellently with Kappa number determinations. A correction is applied to compensate for background absorption at zero Kappa number. The precision of the lignin determination method is plus or minus 2 relative percent. It has potential advantages where micro sampling is involved and the pulps are modified or the pulp lignin contains solubilizing groups. (Author's abstract modified)

13569

Starkman, E. S. and H. K. Newhall

THERMODYNAMIC PROPERTIES OF METHANE AND AIR, AND PROPANE AND AIR FOR ENGINE PERFORMANCE CALCULATIONS. Preprint, Society of Automotive Engineers, Inc., New York, 17p., 1967. 18 refs.

A chart-form review of the thermodynamic properties of selected fuel-air mixtures suitable for utilization in engine performance calculations was presented. Methane and propane, representative of natural gas, and LPG were the fuels considered. Comparisons were made between the performance to be expected with these gaseous fuels compared to octane as representative of gasoline. Cycle analysis showed loss in power could be anticipated when converting from gasoline fuel to LPG with further loss between LPG and natural gas.

14551

Cronan, C. S.

OIL REFINING FLOWS FULL...HIGH PURITY AROMATICS FROM COKE-OVEN OIL. Chem. Eng., 66(2):110-113, Jan. 12, 1959.

The Jones and Laughlin Steel Corp. has been successfully producing high-purity aromatics from crude coke oven light oils since 1957. The light oil is produced during the high temperature carbonization of coal to make metallurgical coke, and is recovered from the coke oven gas by scrubbing with an absorbent oil. It is then sent to stripping towers to remove carbon disulfide and other light ends. After pretreatment, the light oil is heated and fed to a hydrofiner reactor. After caustic scrubbing, benzene, toluene, and xylene products are separated from gases and sent to a steam stripper where residual H2S is removed; they then proceed to Udex extraction. The Udex process extracts aromatics from paraffins using aqueous diethylene glycol, then strips pure aromatics from the glycol. Final fractionation of the finished products is done in three towers: two continuous towers for benzene and toluene, and a batch column for xylene. A flowsheet illustrating the process of hydrofining and extraction is included.

14580

Glushko, G., J. Tamagno, and I. Fruchtman

AN ANALYSIS OF HYDROCARBON-AIR COMBUSTION FLAMES. Preprint, American Inst. of Aeronautics and Astronautics, New York, Technical Information Service, 51p., 1966. 11 refs. (Presented at the AIAA Second Propulsion Joint Specialist Conference, Colorado Springs, June 13-17, 1966, Paper 66-573.)

The overall structure of the combustion process in a jet flow of hydrocarbon-air mixtures was studied both experimentally and analytically. The hydrocarbons considered were methane, ethane, propane, and ethylene, with flame stabilization assured by a small oxy-hydrogen pilot. This research was essentially basic in nature; however, in choosing particular aspects for investigation, the selection was oriented toward fuels and conditions pertaining to supersonic combustion in ramjet engines. Flame propagation angles were determined by means of time exposure direct photographs, supplemented by measurements of mean total temperature and total static pressures for various values of stoichiometric equivalence ratios. The progress made in the incorporation of finite rate hydrocarbon chemistry with numerical techniques for the computation of flows with viscosity, diffusion, and heat transport is presented. The first case to date has been for the methane-air combustion system and has resulted in numerical solutions which are in good agreement with experiments. The formulation of mathematical models for the description of high speed combustion flames as described by the foregoing methane-air combustion has resulted in new insights into the mechanisms of combustion rate phenomena in flames.

13636

Whitehouse, A. G. R.

THE HEAT OF ADSORPTION OF GASES BY COAL AND CHARCOAL. J. Soc. Chem. Ind., 45:137-207, Jan. 15, 1926. 18 refs.

Although the adsorption of gases by charcoal and other substances has been investigated extensively during recent years, the thermal change accompanying this phenomenon has received much less attention. In view of this experiments were conducted with different types of coal and charcoal to measure the adsorption of SO2, nitrogen, methane, CO, CO2, and oxygen using specially designed adsorption apparatus and a calorimeter. The heat evolved/cc of gas absorbed decreased as more gas was absorbed; the results obtained with charcoal and the different coals were very similar. The values obtained for the heat evolved/cc of gas adsorbed were: CO2:0.346-0.255 cal; SO2:0.627-0.359 cal; methane: 0.285-0.199 cal; oxygen: 0.19-0.17 cal; nitrogen:0.22-0.17 cal; and CO:0.198-0.188 cal. An equation is given relating the total heat evolved/g of adsorbent with the total volume of gas adsorbed/g of adsorbent. The gases studied were adsorbed more slowly by coal than by charcoal; the differences were most pronounced in the cases of methane and nitrogen.

14666

Nagasawa, Sin

FUNDAMENTAL STUDIES OF ADSORPTION OF GASES AND VAPOURS BY ACTIVE BENTONITE. Tohoku J. Agr. Res., 4(1):75-95, 1953. 6 refs.

Adsorption of gases and vapors by active bentonite which was prepared from commercial bentonite and activated by acid and heat treatments was measured. Isothermal equilibrium was measured and the empirical formulas of Freundlich's type were determined for benzene, sulfur dioxide, ammonia, and water vapor. Each isosteric equilibrium and isobaric equilibrium was calculated, and expressed by empirical formulas. Each desorption equilibrium was measured. The hysteresis-like phenomenon was observed with benzene, water, and sulfur dioxide at several temperatures. Isosteric differential heat of adsorption was calculated. From those values, and from the desorption equilibrium, it was ascertained that capillary condensation might take place at high relative pressures. (Author abstract modified)

14686

Fischer, Hans

COMPARATIVE STUDY OF THE ADSORPTION OF GASES ON CHARCOAL IN SOLUTION. (Vergleichende Untersuchung uber die Adsorption an Holzkohlen in Losung und in Gasen). Text in German. Kolloid-Beih., 42(9-2):125-181, 1935. 17 refs.

The adsorption capacity of eleven types of coals in solution was determined. The amount adsorbed during equilibrium conditions and during a certain period of time, as well as the adsorption

speed, were determined each time. Prior to the tests, the purity of the coals was determined. For the study of adsorption in solution, succinic acid in aqueous solution, iodine in aqueous KI solution, iodine in alcoholic solution, and methylene blue in aqueous solution, and the gases SO2, CO2, and C2H4 were used. Dry carbon was mixed with one of the above substances in solution, shaken, and after some time the concentration was determined by titration. With gases, the adsorbed amount was determined by measurement of the pressure difference caused by adsorption. It was found that in solutions all types of coals reached the adsorption equilibrium slowly. The adsorption speed depended very much on the grain size of the carbon particles; the larger the particles, the lower the adsorption speed. Porous coal adsorbed rapidly, dense coals slowly. Succinic acid was adsorbed best, methylene blue least. The adsorption capacity of porous coal in solution was higher than that of dense or indistinct coal. The same results were obtained for the adsorption of SO2 vapor. With C2H4 and CO2, however, the dense coals had a higher adsorption capacity than the porous ones. The adsorption speed was higher with gases owing to the higher molecular motion of gases. It was concluded that the various types of coals showed no markedly different adsorption properties. Greater difference existed only between impure, hasty ordinary retort coal and activated tar-free coals.

11766

Graham, J. Ivon

THE ADSORPTION OR SOLUTION OF METHANE AND OTHER GASES IN COAL, CHARCOAL, AND OTHER MATERIALS. Colliery Guardian (London), 122(3160):809-811, Sept. 16, 1921. 7 refs.

The adsorption curve for coal dust and CO2, up to a 50% concentration, was first obtained by making several additions of known quantities of the gas and reading the equilibrium pressure. A definite amount of methane was then added and allowed to act for two days, to ensure equilibrium between the CO2 and methane in the gas mixture and that adsorbed by the coal. The points obtained for the adsorption of CO2 alone, and mixed with methane lay practically on the same curve when allowance was made for experimental error. There was, however, a marked effect on the adsorption of methane. A much smaller amount was adsorbed by the coal when CO2 was present than when only methane was present. It was found that when moisture was added to the coal dust, its adsorptive capacity decreased by 25%, and when 10.5% pyridine was added, the adsorptive capacity was reduced to a lower level. Crushing the coal in the laboratory did not produce an increase in the coal adsorption proportionate to the increase in surface area. It was concluded that the actual surface area of the particle forms only a small proportion of the total surface available for adsorption. Coal dust was examined for use in Grey respirators during 1917-1918. It was found that while it was very effective for adsorbing chlorine gas, it was useless for the adsorption of carbon monoxide.

19876

Bosy, H. and W. Hess

ADSORPTION OF GASES BY ACTIVE CHARCOAL. (Ueber die Adsorption von Gasen durch aktive Kohle). Text in German. Kolloid - Z. (Germany), 61(3):313-322, Dec. 1932. 12 refs.

The adsorbability of a number of gases by a highly active charcoal was studied. A simple relationship was found to exist between the adsorbabilities at 15 C and the vapor pressures of the liquefied gases at 15 C. The dependence on pressure of adsorption at room temperature (15 C) of the gases H2, O2, N2, N2O, CO2, SO2, and CH3Cl was investigated as was the dependence on temperature of the adsorption at atmospheric pressure of the gases H2, CO2, SO2, NH3, and CH4. An empirical formula was derived which jointly represents the adsorbabilities of the latter gases at those temperatures at which their vapor pressures are equal. A few exploratory experiments were carried out on the adsorption of gas mixtures by charcoal. It was discovered that with any of the several gas mixtures used, the total amount adsorbed was not related simply to the sum of adsorbabilities of its individual components. However, this amount corresponded approximately to the mean value of the adsorbabilities of the individual components of the mixture.

19882

Airey, E. M.

GAS EMISSION FROM BROKEN COAL. AN EXPERIMENTAL AND THEORETICAL INVESTIGATION. Int. J. Rock Mech. Min. Sci., 5(6):475-494, Nov. 1968. 7 refs.

Deep soft seam coal from the Sherwood Colliery ranges in size between 0.5 in. and 300 mesh was brought into equilibrium with methane at pressures of 50, 150, and 300 psi. One empirical formula with only three constants was developed to describe the rate of degassing observed for all the sizes, pressures, and moisture contents tested. Errors in the empirical formula were very small. A theory based on gas flow through a homogeneous solid is shown to give poor agreement with experimental results. A theory incorporating a mathematical model including a crack system is shown to be compatible with the empirical equation.

19931

Seery, Daniel J. and Craig T. Bowman

A SHOCK TUBE STUDY OF METHANE OXIDATION. Preprint, Am. Chem. Soc., Washington, D. C., Div. Fuel Chem., 11(4):82-95, 1967. 11 refs.

An experimental study was made on the oxidation of methane behind reflected shock waves to provide information on the reaction mechanism and chemiluminescence for high temperature oxidation. In this study, pressure, OH, CH, CO, CO2, and H2O emission and

OH absorption were monitored during the reaction. Using a proposed 15 step reaction mechanism, temperature, pressure, and concentration profiles were calculated for the conditions of the experiment. The concentrations of the intermediates increased rapidly during the early stages of the reaction and then maintained a constant value through most of the induction period. Induction time was defined to be the time between the heating of the gas by the reflected shock wave and the rapid increase in pressure or characteristic emission or absorption. Carbon monoxide and H2O showed a rapid increase early in the induction period and then increased linearly to their equilibrium concentrations. Carbon dioxide increased linearly from the start and only at the end of the induction period did it increase rapidly. A peaking of OH emission was observed; however, OH emission and OH absorption were found to increase simultaneously during the reaction. From the pressure and OH emission, it was concluded that the reaction passes through two phases - a first phase in which the pressure and OH emission increase slowly, followed by a second phase in which the pressure and OH emission increase rapidly.

19933

Lyublina, E. I.

RELATIONS BETWEEN PHYSICO-CHEMICAL PROPERTIES OF HYDROCARBONS AND THEIR TOXICITY. (O svyazyakh fiziko-khimicheskikh svoystv uglevodorodov s ikh toksichnost'yu). Text in Russian. Gigiena i Sanit., no. 7:20-25, 1969. 4 refs.

A formula is suggested for preliminary calculation of toxicity indices on the basis of a correlation existing between the physicochemical properties of hydrocarbons and their lethal concentrations for mice and that of their maximal permissible concentrations in the air of industrial premises. From the molecular weights and boiling points of volatile hydrocarbons, it is possible to calculate the value of LD50 and various physicochemical constants of hygienic significance by means of a given nomogram. (Author Summary modified)

19145

Bjorklie, John and Stephen Luchter

MARINE CYCLE WORKING FLUID SELECTION AND SPECIFICATION RATIONALE. Preprint, Society of Automotive Engineers Inc., New York, N. Y., 10p., 1969. 16 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690063.)

Present applications of Rankine cycle turboalternators and turbogenerators cover a power range of 2.5 orders of magnitude and extend from unattended microwave repeater stations to marine and automotive installations. Organic working fluids used include dowthers, dichlorobenzene, toluene, liquid metals, water, monochlorobenzene, perfluorodecalin, and hexafluorobenzene. As more potential applications for the Rankine turbine and reciprocating systems become apparent, a family of new organic fluids suited to quantity applications must be developed.

ideally, these fluids will have high thermal efficiency. The best will be those whose vapor pressures extend across temperature fields without going beyond pressure limits. Alternatives will be fluids requiring low superheat and having the widest temperature difference between peak and minimum pressure. Other requirements are high molecular weight, thermal stability, freezing points below minimum temperature, isentropic saturated vapor lines, and a liquid specific heat of 0.6. Fluids must be compatible with common construction materials.

18158

Swinnerton, J. W.; V. J. Linnenbom, and C. H. Cheek

DISTRIBUTION OF METHANE AND CARBON MONOXIDE BETWEEN THE ATMOSPHERE AND NATURAL WATERS. Environ. Sci. Technol., 3(9):836-838, Sept. 1969. 11 refs.

Methane and carbon monoxide concentrations in the atmosphere and in natural waters were measured from samples collected during an oceanographic cruise between Washington, D. C. and Puerto Rico in June 1968. The purpose of the measurements was to determine to the level of these concentrations and to obtain information on the direction of net transport across the air-water interface. Such information is expected to prove helpful in determining whether these gases are being generated in the water by biological processes and escaping into the atmosphere, or whether as the result of relatively high atmospheric partial pressures, the gases are going into solution in the seawater. The concentration of methane was highest in the upper Potomac River and decreased as the ocean was approached because of pollution in the river and bay waters. Methane was at equilibrium between the atmosphere and the open ocean where its average concentration in the atmosphere was 1.26 plus or minus 0.03 ppm. It is still not clear whether the ocean is acting as a source or a sink for methane under equilibrium conditions. Conversely, carbon monoxide concentrations increased in the open ocean relative to the river and bay waters. Equilibrium was not observed for carbon monoxide, and the net transport of this gas appears to be from the water into the atmosphere for all samples analyzed. Atmospheric carbon monoxide concentrations ranged from 0.075 to 0.44 ppm. Possible natural sources of carbon monoxide in the open ocean are the photochemical decomposition of organic matter near the surface and its production by various algae, green plants, and some species of siphonophores. (Author abstract modified)

18164

Hansen, Andrew C., Jr.

CONVERSION OF SULFUR-CONTAINING HYDROCARBONS. (Universal Oil Products Co., Inc., Des Plaines, Ill.) U. S. Pat. 3,461,082. 4p., Aug. 12, 1969. 1 ref. (Appl. Sept. 6, 1966, 9 claims).

A principal object of the invention is the production of high octane gas by an economical combination of hydrorefining and catalytic reforming of hydrocarbon mixtures contaminated with sulfur compounds. A related object is the integration of a hydrocarbon conversion process with a hydrocarbon treating

process. One embodiment of the invention involves a combination process for the conversion of sulfur-containing hydrocarbon stock charge. This comprises the steps of (a) contacting a naphtha charge stock and hydrogen with a cobalt-molybdenum hydrogenation/desulfurization catalyst in a fixed bed reactor at conditions selected to convert sulfurous compounds to hydrogen sulfides and hydrocarbons; (b) removing hydrogen sulfide from the hydrorefined effluent; (c) introducing at least a portion of the remaining effluent into a conversion zone where the hydrocarbons are contacted with a catalyst of alumina, platinum, and combined chloride; and (d) recycling at least a portion of the conversion zone effluent to combine with an alkylaromatic hydrocarbon stock charge prior to contacting the latter in the hydrorefining zone, and separating the remaining conversion zone effluent to provide a hydrogen-rich gaseous phase and a normally liquid carbon product. The process produces a substantially debutanized pentane plus product in amounts from 3030 to 3080 b/d. Two changes are instituted in the combination process for catalytically reforming sulfur-containing hydrocarbon charge stock. A portion of the hydrorefined effluent is introduced into a catalytic reforming reaction zone containing a platinum catalyst, and the total reformed effluent is combined with a stock charge of gasoline boiling range hydrocarbons prior to contact in the hydrorefining zone.

19220

Gilbert, Everett E. and E. Paul Jones

SULFONATION AND SULFATION. Ind. Eng. Chem., 53(1):501-507, Jan. 1961. 167 refs.

The literature published in 1960 on the chemistry of sulfonation and sulfation is reviewed. New procedures are reported and the properties and possible uses of new products are summarized. Topic headings include the direct sulfonation of polyethylene film, alpha-sulfonation of pelargonic acid with SO_3, oxidative sulfonation by aqueous chlorination of trithiane, sulfonation with SO_3 complexes, polymerization and condensation methods, aromatic sulfonation with H_2SO_4, the preparation of long-chain alkylated aromatics, the preparation of polystyrene and aromatic resins, benzene and naphthalene derivatives, the direct preparation of aromatic sulfonyl chlorides, sulfation of alkenes, monohydric alcohols, glycol esters and ethers, and the sulfonation of cyclohexylamines and inulin.

19227

Farnsworth, H. E. and R. F. Woodcock

EFFECTS OF RADIATION QUENCHING, ION-BOMBARDMENT, AND ANNEALING ON CATALYTIC ACTIVITY OF PURE NICKEL AND PLATINUM SURFACES. II. HYDROGENATION OF ETHYLENE (CONT'D); HYDROGEN-DEUTERIUM EXCHANGE. Advan. Catalysis, Vol. 9:723-730, 1957. 11 refs.

A method for cleaning a wide variety of solid surfaces in high vacuum permits the separation and individual investigation of factors affecting the chemical properties of catalysts: lattice defects, electronic and geometric factors, and contaminants, including chemisorbed gas. The method consists of high-temperature outgassing, radiation quenching, argon-ion

bombardment, and annealing and is applicable to both single crystals and polycrystalline forms. A mass spectrometer provides continuous or intermittent gas analysis. In experiments involving the hydrogenation of ethylene on nickel and platinum catalysts, catalytic activity after ion bombardment was essentially the same as that after radiation quenching. Activity after these treatments is higher than after subsequent annealing, suggesting that annealing removes surface lattice defects which contribute to high activity. Results also indicate that small amounts of impurities promote catalytic activity, while larger amounts of the same impurity act as a poison. Measurements of hydrogen-deuterium exchange on a nickel surface revealed no appreciable difference in activities of annealed and quenched surfaces, indicating that the rate-controlling factor for the hydrogen-deuterium reaction is not the same as that for the hydrogen-ethylene reaction.

14258

Sherman, Albert and Henry Eyring

QUANTUM MECHANICS OF ACTIVATED ADSORPTION. J. Am. Chem. Soc., 54(5):2661-2675, July 1932. 12 refs.

When binding energies are expressed as 10% of the total for all atom pairs, the quantum mechanical calculations of the activation energies for the hydrogenation of ethylene, acetylene, and the activated adsorption of hydrogen on charcoal at zero K are, respectively, 51.9, 28.5 and 0.8 kg cal. Better agreement with the values obtained by Pease occurs when the coulombic energy is taken as 14% of the total binding. The mechanism for the conversion of ortho- to para-hydrogen on charcoal involves three steps: activated adsorption, collision and reaction of two adjacently adsorbed hydrogen molecules, and desorption. At very low temperatures, the last step, a zero-order evaporation process, is undoubtedly the rate-determining step. As the temperature increases, the rate of desorption increases until finally the collision of two adjacently adsorbed molecules is the slow process. With increasing temperature, the chance of two hydrogen molecules being adsorbed in adjacent positions approaches zero, and simultaneously the conversion of para- to ortho-hydrogen drops to zero. Since the adsorption obtained is the so-called atomic adsorption, the C-H bonds must have strength of 51.8 kg cal in order that the final bonds will have strength of only 3 kg cal more than the initial hydrogen bond. A carbon dioxide distance of 3.6 A is most favorable for calculating the energy of the bonds at 51.8 kg cal. The mechanism of conversion is assumed to involve the collision of a hydrogen molecule from the gas phase with an adsorbed hydrogen molecule. The problem of spin degeneracy of six electrons is solved, and an equation for the potential binding energy of the six electrons is applied to the calculation of activation energies.

14293

Veatman, W. B.; T. B. Brenn, and E. H. Schlag

PHOTOIONIZATION RESONANCES SPECTRA. I: NITRIC OXIDE AND BENZENE. Chem. Phys. Letters (Amsterdam), 3(7):483-487, July 1969. 21 refs.

A new method is described for the study of ionised molecules by direct observation of optical resonance in photoionisation. This method interposes an electron filter in the system so that a signal is detected in the measuring circuit only at the point where the optical monochromator sweeps through a resonance transition. Photoionisation is carried out at the intersection of a well-focused beam of light and a high intensity molecular beam at right angles to the photon beam. Electrons are withdrawn perpendicular to both of these beams. The energy of the photoionisation resonance is directly read off the setting of the optical monochromator. Contributions from lower photoionisation processes are avoided. Photoionisation resonance scans of benzene show the presence of two peaks at 10.385 and 10.671 eV, respectively. It is thought that these peaks are due to a new electronic level of $C_6H_6^+$ at 10.385 eV and that this level corresponds to the removal of a sigma electron from the benzene molecule. Data obtained for NO^+ using this method were compared with data previously obtained by other methods. The average ionisation potential of five experimental runs was in exact agreement with the spectroscopic value of other investigations.

19313

Lederer, E. L.

VERIFYING ADSORPTION FORMULAS BY MEANS OF ADSORPTION MEASUREMENTS WITH ACTIVATED CHARCOAL. (Prüfung von Adsorptionsformeln an Hand von Adsorptionsmessungen bei einer hochaktiven Kohle). Text in German. Kolloid-Z. (Stuttgart), 61(3):328-330, 1932. 15 refs.

Data reported by Henry on the adsorption of gases and vapors on activated charcoal were used to verify isothermal and isosteric adsorption laws. In the isothermal case, no decision can be made between a logarithmic law and the formula of Langmuir. In the isosteric case, a logarithmic law seems to fit the results best. The isosteric curve of Trouton and Poole and the relationship of Gurwitsch fit the data only moderately well. The relationship between the vapor pressure and the adsorbed volume of various gases indicates that equal amounts of different gases are adsorbed, referred to corresponding states. Gas mixtures are adsorbed proportionally, provided the concentrations are modified by the influence of the mean molecular velocities and the shape of the molecules. The adsorption data for the following gases were used: CO_2, N_2O, HCl, H_2S, NH_3, Cl_2, CH_3Cl, SO_2, CH_4, and $CO(Cl)_2$.

19435

Kliesch, Richard L.

OXIDATION OF CO AND HYDROCARBONS OVER SUPPORTED TRANSITION METAL OXIDE CATALYSTS. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968. 11 refs.

The reactivities of a series of potentially useful catalysts for the oxidation of carbon monoxide and propylene were examined, singling out the copper oxide-alumina system for more intensive study. Evidence was obtained which indicates that these oxides act as stoichiometric oxidizing agents for carbon monoxide. Mass-transfer limitations were examined in the copper oxide-alumina system for the oxidation of carbon monoxide and hydrocarbons at low concentration levels, showing the importance of this effect. The ease of catalytic oxidation of a series of hydrocarbons could be correlated with the atmospheric nitric oxide photooxidation rates of these hydrocarbons. The extent of the inhibition of these oxidation reactions by water and carbon dioxide at realistic exhaust gas concentration levels was also examined. Other more subtle features of these reactions were also examined, and explanations were offered in terms of simple mechanistic concepts where possible. (Author summary modified)

14379

Lavrov, N. V.

PHYSICOCHEMICAL MECHANISM OF NATURAL GAS COMBUSTION. (Fiziko-khimicheskiy mekhanizm goreniya prirodnogo gaza). Text in Russian. Teoriya i Prakt. Sbornik Rabot Nauchn.-Tekhn. Obshchestva Energ. Prom., vol. 3:135-150, 1957. 12 refs.

The mechanism of natural gas combustion are discussed in terms of oxidation and reduction of methane. This theoretical treatment is based on a review of the literature. The following topics are treated: physicochemical regularities in the process of fuel combustion; peculiarities of methane combustion; gasification of methane; methane conversion reactions; chain mechanism of methane combustion; low-temperature oxidation of methane; mechanism of methane combustion at elevated temperatures (proposed by the author together with I. G. Petrenko); intermediate compounds and primary products of methane combustion. The proposed high-temperature combustion mechanism is based on the following assumption: chemical reaction with oxygen involves separate stages of thermal decomposition of methane; formaldehyde is regarded as an intermediate compound in the methane-oxygen reaction analogous to physicochemical processes found in carbon-oxygen combustion; methane combustion is subdivided into three stages (incomplete combustion to formaldehyde, decomposition of formaldehyde to CO and H2, combustion of CO and H2).

14385

Stashenskiy, A. I., V. S. Luk'yanchikov, and V. G. Protsenko

OXIDATION OF NITROGEN DURING COMBUSTION OF METHANE-NITROGEN-OXYGEN MIXTURES. (Okisleniye azota pri gorenii metano-azoto-kislorodnykh smesey). Text in Russian. Khim. Prom. Ukr. (Ukr. Ed.), no. 1:7-9, 1957. 2 refs.

A methane-nitrogen-oxygen mixture was burned at a rate of 50 cu m/hr. Enriched air with an oxygen content of 40 to 71% was provided in an excess of 1.1 to 2.6. Inlet temperature ranged from 300 to 500 C and maximum NO yield (1.02%) was obtained with an oxygen content of 70% and an air excess of 1.7

(equivalent to equimolar nitrogen-oxygen ratio in combustion products). It is concluded that such a continuously operating arrangement for fixing atmospheric nitrogen has a number of advantages: constant NO concentration, ease of process control and possibility of automatic control, low thermal cycling ensures prolonged and reliable operation of refractory materials made of MgO or ZrO2. The combustion chamber used was described in an earlier article.

16198

Antonishin, N. V.; V. A. Borodulya, A. M. Gulyuk, G. G. Gabrodskiy, and V. A. Maskovich

COMBUSTION OF LIQUID AND GASEOUS FUELS IN A FLUIDIZED BED OF FINE-GRAIN MATERIAL AND UTILIZATION OF HEAT FROM THE EXHAUST GASES. (O szhiganii zhidkogo i gazoobraznogo topliva v psevdoozhizhennom sloye melkozernistogo materiala i utilizatsii tepla ukhodyashchikh gazov). Text in Russian. Fiz. Goreniya, Akad. Nauk Ukr. SSR, Kumpuk. Nauchvedom. Sb., 1965:20-25.

Experimental studies were made of the combustion of liquified propane-butane, and of moist oil in fluidized beds at the Institute of Heat and Mass Exchange of the Belorussian SSR Academy of Sciences. Gas combustion studies were made with quartz sand particles graded at 0.2-0.6 and 1.6-3.0 mm in a 75-mm diameter tube and in a 0.04 sq m chamber. Bed height was 150-200 mm and maximum temperature occurred at a height of 50-70 mm. A bed temperature of 850-1000 C gave sufficiently complete combustion with an air excess of 1.05-1.2. Liquid combustion studies were made with clean brick fragments graded at 2-3, 3-5, and 5-7 mm in 75- and 100-mm diameter tubes. An air excess of 1.4 in the 75-mm tube gave 96-97% combustion, and an air excess of 1.15 in the 100-mm tube gave 99.1% combustion. The experimental data are used in proposing a theoretical scheme for recovering heat from exhaust gases by circulating the material of the fluidized bed so as to pass incoming air through it for preheating.

16191

Rimarov, A. V.

NATURE OF HYDROCARBON ADSORPTION ON GRAPHITE, OXIDES, HYDROXIDES, AND CHEMICALLY MODIFIED SURFACES. (Priroda adsorbtsii uglevodorodov na grafite, okislyakh, gidrookisyakh i khimicheski modifitsirovannykh poverkhnostyakh). Text in Russian. Gaz. khromatogr.; Tr. Petrol. konf.; Akad. Nauk SSSR, Moscow, 1959, p. 45-60. 61 refs.

Considerations necessary for a better theoretical and practical understanding of chromatographic separation of hydrocarbons are presented. Topics examined are: absorption energy of hydrocarbons on graphitized carbon black and magnesium oxide; absorption energy of hydrocarbons on hydroxides; adsorption isotherms for individual hydrocarbons on a uniform surface; effect of chemical modification of absorbent surface on the absorption of hydrocarbons; effect of geometrical modifications of absorbents--creation and alteration of surface--on the absorption of hydrocarbons. It is recommended that further

work center on the following items: theory of adsorption forces, calculation of adsorption energy, measurement of heat of adsorption at different temperatures; statistical theory of adsorption equilibria, measurement of heat capacity of adsorption systems; investigation of the state of surface chemical compounds and adsorption complexes using infrared spectra and other new methods; investigation of the geometric structure of adsorbents and structure modification; investigation of the chemical structure of surfaces and their chemical modification; investigation of adsorption equilibria for gas mixtures, especially by the vacuum circulation method using new adsorbents.

19399

Dimsoghy, D.

THEORETICAL AND PRACTICAL DEVELOPMENT OF FLAME RESEARCH. (Theoretische und praktische Entwicklung der Flammenforschung). Text in German. Freiberger Forschungsh. B, no. 120:181-200, 1967. 15 refs.

Historical development and fundamentals of flame research are reviewed. With respect to the microstructure of flames, burning velocity and the importance of secondary air in reducing the flame are discussed. Pertinent experiments in Hungary were concentrated on the study of the combustion for natural gas, the main fuel in the steel industry. Formation of soots can be avoided if stoichiometric combustion and uniform flame temperature are maintained. The effect of secondary air was studied by means of a ceramic flame tube. The gases were analyzed by gas chromatography with CO2 as carrier gas. It was found that the least amount of soots is formed when (CO2/CO) plus (H2O/H2) is less than one. Larger experiments were conducted in a chamber furnace where 14.4 cu m natural gas per hour were burned with 130 cu m air per hour. Heating tests were performed with 30 mm brass blocks. In furnaces with radiative heat transfer, it is important to destroy the boundary layers at the walls. This is done by sucking the flue gases through openings in the walls. Thirty such furnaces were constructed and they now operate in series throughout the country. The wall temperatures in these furnaces are typically 1080 C without wall channels and 1250 C with wall channels.

19419

Hasebe, S., T. Shimomura, H. Kubo, and T. Kitagawa

NITRIC OXIDE DE[illegible]STION. Chem. Eng. Progr., 82(4):92-96, April 1986. 8 refs.

A method was found to analyze low-concentration hydrocarbons assumed to have contributed to an explosion in the second heat exchanger of a nitrogen wash unit. Acetylene, 1,3-butadiene, and ethene existed in the crude gas in the order of 2 to 3 ppm, 0.2 to 0.4 ppm, and 0.2 to 0.7 ppm, respectively. Nitric oxide was detected at concentrations in the order of 0.005 to 1 ppm through oxidation with permanganate and sulfuric acid, followed by colorimetric detection with the Griess-Saltzman reagent. Findings showed that more than 90% of NO entered the unit accumulated in the second heat exchanger, most of it oxidized to nitrogen dioxide and nitrous anhydride, which is more reactive with hydrocarbons

than NO. Experiments confirmed the possibility of spontaneous ignition in the second exchanger and the composition of reaction products between nitrogen and conjugated dienes. An absorption process is now used to remove NO, in which NaClO2 or ClO2 are added to the wash-water circuit.

19713

Bureau, F. and F. Schrats

STUDY OF ADSORPTION HEATS OF SO2 AND C3H8 ON NaCl AND OF C3H8 AND C2H6 ON DECOMPOSED KMnO4. (Ueber Adsorptionswaermen von SO2 und C3H8 an NaCl und Von C3H8 und C2H6 an zersetztem KMnO4). Text in German. S. Physik. Chem. Abt. A (Leipzig), 189(2-3):115-130, 1942. 22 refs.

In an experimental set-up completely isolated from the atmosphere, the adsorption isotherms of SO2 and propane (C3H8) on NaCl powder and of C3H8 and ethane (C2H6) on decomposed KMnO4 in the temperature range from 0 C to 50 C were determined. To increase the accuracy of the measurement, the experimental set-up was enclosed in a thermostat especially constructed for this purpose. The NaCl powder was obtained by melting cleaned NaCl in a high vacuum and by pulverizing the crystals in a nitrogen atmosphere. The KMnO4 was prepared by heating under low pressure without contacting any gas other than the oxygen liberated during the process. The adsorption heats were determined and results show that adsorption is caused by van der Waal forces. The experiments also confirmed observations made with coal, namely that the individual surface points develop different energies. Surface points with high adsorption potential cause chemisorption, which was weak between SO2 and NaCl and more pronounced between C3H8 and C3H8 and decomposed KMnO4. The points of high adsorption potential disappear by crystalline transformation due to heating.

19450

Heller, E., E. Schwabe and E. Viessmann

ELECTROCHEMICAL CLEANING OF INDUSTRIAL WASTE GASES AND DEVELOPMENT OF A NEW TWO LAYER ELECTRODE. (Ueber die Reinigung von Industrieabgasen auf elektrochemischem Wege und die Entwicklung einer neuartigen Zweischichtelektrode.) Text in German. Dechema Monograph, 59(1045-1069):147-157, 1968. 14 refs.

Elimination of gaseous pollutants from industrial waste gases poses many problems, particularly the removal of SO2. In an effort to find a satisfactory solution, electrochemical fuel cell experiments were conducted with SO2 diluted with inert gas to obtain a realistic concentration. Results of galvanostatic tests showed that 90% of the SO2 could be removed from the waste gas fed to the anode. Measurement of the potentials against a Hg/Hg2SO4 reference electrode in 3.8 n H2SO4 showed that at a fuel dilution of 1:1000 there are theoretical limits with respect to the attainable current density and the cell voltage. Further experiments were concerned with removal of other substances in the waste gas in electrochemical fuel cells. Since oxygen electrodes are 'blubber' electrodes, no difference between pure oxygen and air as reactant was found at the cathode. With methane

and carbon monoxide only, considerably lower current densities could be achieved. For conversion of reaction gases, it is advisable to use tightly-sealed, non-gassing electrodes with high electrochemical activity. These demands are fulfilled by a carbon electrode consisting of a hydrophobic substrate and a gas hydrophobic coating. The coating layer is produced by surface decomposition of the binding and hydrophobizing agent of a hydrophobic carbon body in the presence of a catalyst such as Ag, Pt, etc. Its use as an oxygen electrode is discussed. The effects of operating parameters such as temperature, gas pressure, oxygen partial pressure and KOH concentration on electrochemical power generation and on long-term performance are discussed.

14500

Gottauf, M.

GAS-CHROMATOGRAPHIC DETERMINATION OF ORGANIC COMPOUNDS IN AIR IN PRESENCE OF OZONE. (Gas-chromatographische Bestimmung organischer Verbindungen in Luft bei Anwesenheit von Ozon). Text in German. Anal. Chem., 246(1):31, 1969. 2 refs.

Trace analyses of organic compounds in air can be successfully performed by using a gas chromatographic method. The air sample is passed through a cold trap which causes the organic compounds to condense. The carrier gas then takes them through the chromatographic column. In the presence of ozone, the ozone is also condensed, at least in part, in the cold trap and begins to react with certain organic compounds either immediately or during the heating process. Many organic substances are thus destroyed and cannot be analyzed. This result can be avoided by adding an excess amount of ethylene to remove the ozone. This method was successfully used for measurements of the reaction rate between ozone and various gaseous odorants. It was possible to determine hexanal, 2-hexenal, limonene, allylisothiocyanate, and pyridine in concentrations of 10 to the minus eighth power mole/l at ozone concentrations between 10 to the minus seven and 10 to the minus five mole/l.

14522

Gouba, J. L.

MAXIMUM TEMPERATURES ATTAINABLE BY COMBUSTION OF CARBON AND METHANE IN AIR. (Temperatures maximales susceptibles par combustion du carbone et du methane dans l'air). Text in French. Genie Chim., 93(6):103-110, Oct. 1965. 6 refs.

A thermodynamic study made possible the prediction of the effects of preheating of combustibles and supporters of combustion as well as the influence of the combustible/combustion supporter ratio, burning methane and carbon, respectively, in air. A simple approximation to account for calorific losses in the heat exchanger during preheating is possible if it is assumed that heat losses are solely due to radiation. The combustible/combustion supporter ratio is much more important in the carbon-air system than in the methane-air system.

19648

Dimov, Rene Pentschev

CHROMATOGRAPHY OF THE LIGHT GASES ON METAL-SUBSTITUTED SILICA GELS. (Chromatographie der leichten Gase auf metallsubstituierten Silikagelen). Text in German. Abhandl. Deut. Akad. Wiss. Berlin, Kas-Chromatog. 1965, no. 2:C131-C136, 1966. 16 refs.

On silica gels whose hydroxyl group hydrogens had been replaced by metal ions, the chromatographic separation of a mixture of methane, ethane, ethylene, propane, propylene, and butane were studied. It was expected that on silica gels containing -OAg, -OTa, and -OK groups, polar propylene and polarized ethylene would be retained. However, the alkali metals lead to a reduction of the retained volumes of ethylene and propylene. The alkali earth metals (Ca, Ba) reduced the effect of the hydroxyl groups but not as strongly. Propylene appears between iso-butane and n-butane. Silica gel Cu and silica gel Ag did not pass the olefins at 20 C and with a pressurized carrier gas for 30 min. Silica gel treated with Ag ions was used for analysis of ethane traces in ethylene or of propane and butane traces in propylene. It was found that at 20 C, 30 ml of ethylene can be passed through 1 g of silica gel containing 8 mole % of silver without obtaining any peaks. With larger quantities (50 ml), an ethylene peak is developed in the same time as needed with non-treated silica gel, but this peak is so small that it does not interfere with the quantitative evaluation of the other peaks.

19650

Bindrach, L. V.

ELECTROCATALYSIS AND RELATED PROCESSES AT THE HYDROCARBON ANODE. Franklin Inst. Research Labs., Philadelphia, Pa.; Materials Science and Engineering Dept. and Public Health Service, Durham, N. C.; National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia., Pa., Nov. 1968, p. 607-624. 31 refs.

Several techniques were used to study oxidation reactions occurring at the hydrocarbon anode of low-temperature fuel cells using aqueous acidic electrolytes. They have provided information about surface species and reaction kinetics. Results indicate two major paths for such oxidations, both deriving the required oxygen from water in the electrolyte. The first, and preferred, path involves fission of carbon-carbon bonds to form CH radicals. These rapidly react with water to form a partially oxygenated surface intermediate which in turn reacts further at moderate overvoltage to form CO_2. The second path results in the formation of more refractory multi-carbon alkyl radicals on the surface. They are held to the surface by multipoint attachment and are more difficult to oxidize. Because of the many species present on the electrode surface and changes in coverage and composition with temperature, potential, and time, a study of the steady oxidation of hydrocarbons requires many transient electrical measurements. Some of the techniques used in measurement may prove useful in connection with air pollution and abatement problems. (Author summary modified)

14709

Eisenmann, F. R.

GENETIC EFFECTS OF POLYNUCLEAR HYDROCARBONS: INDUCTION OF MITOTIC GENE CONVERSION. S. Mutationsforsch., 72(1):65-71, 1969. 28 refs.

Mitotic gene conversion is a process which causes genetic variegation in somatic cells by the interaction of two different alleles of the same gene due to a presumably localized pairing of homologous chromosomes. Five polynuclear hydrocarbons were tested for their ability to induce mitotic gene conversion in a diploid strain of Saccharomyces cerevisiae. To enhance the sensitivity of the test system, the yeast was also made respiratory-deficient. Such a strain, in the absence of a fermentable substrate, was deprived of energy sources and consequently, unable to repair DNA damage. Under these conditions, mitotic gene conversion was induced by 9, 10-dimethylbenzanthracene, but not by pyrene, 3, 4-benzpyrene, 1, 2-benzanthracene, or 1, 2, 5, 6-dibenzanthracene. The inactivity of the latter compounds was ascribed either to their inability to react directly with DNA, or to the lack of activating enzymes in the yeast cells. The results are discussed in the light of a general genetic theory of carcinogenesis including harmful genetic effects such as mutation, mitotic recombination, and mitotic gene conversion, as well as cytoplasmic mutation. (Author summary modified)

19811

Abel, Nikolaus, Peter Winkler, and Christian Junge

STUDIES OF SIZE DISTRIBUTIONS AND GROWTH WITH HUMIDITY OF NATURAL AEROSOL PARTICLES. PART II. INVESTIGATION OF THE COMPOSITION OF ATMOSPHERIC AEROSOL PARTICLES BY MEASUREMENT OF PARTICLE GROWTH DUE TO ABSORPTION OF WATER VAPOR AND ORGANIC VAPORS. Max-Planck-Institut fuer Chemie, Mainz, West Germany, Otto-Hahn-Institut, Contract AF 61 (052)-965, AFCRL-69-0105, p. 21-43, Jan. 1969. 15 refs.
AD 684189

A gravimetric method is described for the determination of the growth of aerosol samples in vapors of water and organic solvents. Results of measurements for samples of natural and artificial aerosols for water vapor demonstrate the possibilities of the method and some special characteristics of these growth curves, such as the smooth form of the curves and the hysteresis effect. Experiments show that the typical smooth form of the growth curves of natural continental aerosols can be explained by the presence of salt mixtures and insoluble material. It is found that both the mutual influence on solubility among the various ions, as well as interaction between dissolved and insoluble material, tends to smooth the shape of these curves. The study of hysteresis indicated that this effect is due partly to the supersaturation of solutions and partly to the existence of pores in the aerosol particles or at least in the aerosol sample. There is evidence that the effect of the pores is enhanced by the interaction between soluble and insoluble material. The study of growth of natural aerosol particles in organic vapors showed that organic material

is present which results in similar growth curves as in the case of water vapor. It became clear, however, that growth in organic vapors will influence the subsequent growth in water vapor, that is, that exposure of the aerosol samples to organic vapors is not reversible. Heating of aerosol samples up to 150 C resulted in mass losses up to 15%. This mass loss is due to both organic and inorganic components. For further systematic study of the organic components in aerosols the so-called 'solution' method was developed. In this method, the mass losses are determined after exposure of the sample to a certain sequence of solvents. (Author abstract modified)

14982

Bridgeman, Oscar C. and Elizabeth W. Aldrich

TABULATION OF GAS SOLUBILITIES IN HYDROCARBON AND OTHER NON-AQUEOUS SOLVENTS. Phillips Petroleum Co., Bartlesville, Oklahoma, Jan. 18, 1955, 31p.; 48 refs.
ASTIA, AD:86791

Tables of the available information of the solubility of a number of gases in hydrocarbons and other non-aqueous solvents are compiled. There are a considerable number of methods for expressing gas solubilities. Frequently, the literature data are incorrectly designated or computed, and an attempt was made to rectify these errors. All gas solubility values summarized are expressed as Ostwald solubility coefficients, namely the volume of the gas at the stated temperature and prevailing partial pressure dissolved in one volume of liquid at the stated temperature. This method was selected for uniformity and also because the value is essentially independent of the gas pressure. For high pressures, a correction is required to account for the departure from the perfect gas laws. In the conversion of the literature values to Ostwald solubility coefficients, for which precise relations exist, the final result was expressed to the same number of figures as the original recorded value. Since the data on air solubility is a mixture of gases, the solubility value will depend upon the V/L ratio prevailing at the time of measurement because the different components have different solubility coefficients. This is a matter for detailed computation in each individual case. Such computations were made for all literature data on air solubility and the Ostwald coefficients for air in the tabulation refer specifically to a dissolved gas of normal air composition, unless otherwise noted. Theoretical relations between the solubilities of a given gas in a variety of liquids constitute a guide to weighting the accuracy of values by different observers and can be employed to extend the range of knowledge of the solubility of a given gas in a given liquid.

14917

Jonathan, Neville

INFRARED SPECTROSCOPY APPLICATION TO CHEMICAL KINETIC SYSTEMS. Southampton Univ., Southampton, England, Dept. of Chemistry, Contract AF61(052)-886, Proj. 9658-01, AFCRL-69-0055, 20p., Oct. 21, 1968. 15 refs.
CFSTI, DDC: AD 681 772

Work carried out on atom-molecule and atom-atom reactions in the gas phase is reported. A zeolite pump was designed for studying the reactions at fast flow rates and low pressures. Results are given of studies on three light emitting reactions: atomic oxygen plus nitric oxide, atomic nitrogen recombination, and atomic oxygen plus acetylene. The mechanism by which ozone is adsorbed on silica gel was investigated using infrared absorption spectroscopy. Spectra were obtained for ozone, carbonyl sulfide, and sulfur dioxide adsorbed on an Aerosil pressed disc sample. In each case, a new band was detected at a lower frequency than that due to unperturbed hydroxyl groups, and the new band was found to increase in intensity as the latter decreased. Shifts were measured at various temperatures, and the results explained in terms of the formation of a hydrogen bond between the hydroxyl group on the adsorbent surface and the adsorbate molecule. The temperature dependence of the shift is also consistent with the known properties of the hydrogen bond. As the temperature is increased, the hydrogen bond becomes weaker, and the frequency of the hydroxyl band approaches the value for a free hydroxyl group. It is suggested that both ozone and sulfur dioxide are adsorbed on silica gel through their central atoms rather than through their terminal oxygen atoms.

15065

Crosley, David R.

USE OF OPTICAL PUMPING TO DETECT FREE RADICALS DURING A GAS-PHASE PHOTOLYSIS. J. Chem. Phys., 47(9):1261-1268, Aug. 15, 1967. 32 refs.

An optically pumped system of rubidium was used as a probe to measure the concentration of free radicals present during the vacuum-ultraviolet photolysis of five hydrocarbons. The mechanism for this measurement is the reduction of the relaxation time of the oriented rubidium in the presence of radicals, due to the large spin exchange interaction between the two species. Measurements were made at two different pressures each on methane, ethane, propane, butane, and isobutane and both relative and absolute approximate quantum yields for radical production were determined. Separate detection of hydrogen atoms during the photolysis, through spin exchange coupled electron spin resonance is discussed. This method of directly detecting free-radical intermediates appears to be a useful complement to standard experiments in which reaction mechanisms are deduced from analysis of final products of the photolysis. (Author abstract modified)

15066

Herkstroeter, William G. and George S. Hammond

MECHANISMS OF PHOTOCHEMICAL REACTIONS IN SOLUTION. XXXIX. STUDY OF ENERGY TRANSFER BY KINETIC SPECTROPHOTOMETRY. J. Am. Chem. Soc., 88(24):4769-4777, Nov. 5, 1966. 26 refs.

Conventional flash techniques were used to measure the acceleration of the decay of various sensitizer triplets in the

presence of energy acceptors. An extensive study was made of the stilbenes and 1,2-diphenylpropenes as acceptors. The results are correlated with those obtained earlier in studies of the photosensitized cistrans isomerization of the same substrates. The reactivity in energy transfer remains remarkably high with these substrates even when the triplet excitation energy of the sensitizer is insufficient to produce any known optical transition of the substrates. The result is in good agreement with the hypothesis that flexible molecules can undergo 'non-vertical' transitions to produce twisted geometric forms directly. (Author abstract modified)

15012

Reeds, J. H. and Karl Kammermeyer

ADSORPTION OF MIXED VAPORS. Ind. Eng. Chem., 51(5):707-709, May 1959. 17 refs.

Measurements of the rate of diffusion of components of the system methanol-benzene through porous glass blocks revealed the existence of an adsorption azeotrope in analogy to vapor-liquid azeotropes. At the temperatures studied (15°, 25°, and 35° C), benzene was preferentially adsorbed from the azeotropic vapor-liquid mixtures. However, when present in very high concentrations, methanol was preferentially adsorbed. Thus a composition must exist in the intermediate region which would absorb unchanged in composition. Since the equilibrium between the composition of the vapor and the composition of the adsorbate is graphically similar to common isothermal vapor-liquid equilibria for minimum boiling mixtures of binary constituents, this crossover composition is called an adsorption azeotrope. The curve for vapor-adsorbate equilibrium is, however, shifted toward the methanol-rich side of the vapor-liquid equilibrium system. This shift is more pronounced at lower temperatures or lower pressures. The existence of adsorption azeotropes, as established in these vapor adsorption studies on the benzene-methanol system, has implications in all separation processes using adsorption methods. (Author conclusions modified)

15019

Porter, G. and J. I. Steinfeld

GIANT-PULSE-LASER FLASH PHOTOLYSIS OF PHTHALOCYANINE VAPOR. J. Chem. Phys., Vol. 45:1476-1477, 1966. 6 refs.

Flash photolysis was conducted on phthalocyanine gas to investigate the radiationless processes. Conventional flash photolysis, using a 720-J discharge through flash tubes filled with 3 torr of oxygen, produced a depletion of singlet absorption followed by extremely rapid recovery, faster than could be resolved by the apparatus. When a Q-switched ruby laser flash passed through the vapor, a large, fast depletion of absorbing molecules was observed, followed by a slow recovery. The slow recovery is due to the vaporization of excess solid in the sample tube and subsequent diffusion of the vapor into the absorbing region; thus, the laser flash irreversibly decomposes

a large fraction of the photoionization collection in its path. If the Q-switch is removed from the laser and the full 40-J pulse is passed through the sample, no decomposition is observed. This strongly suggests that a process involving two photons is responsible for the photodissociation. When a similar experiment is carried out in chlorocyclohexane solution at 25 C, the singlet absorption recovers more quickly, and there is apparently no photodissociation. A possible explanation for this, suggested by the observation that the fluorescence yield decreases by a factor of 77 in going from solution at 25 C to vapor at 400 C, is that the second photon is absorbed by a metastable state M*, which could be the lowest triplet or a manifold of different electronic symmetry, producing a state RX, which dissociates. Since the observed rate has an apparent activation energy of 6.5-7.5 kcal/mole, this process will be favored at high temperatures. An additional effect which might be operative is the rapid relaxation of S1 by solvent. This mechanism is supported by our results for conventional flash pyrolysis of tetraphenylporphyrin at 310-350 C, which absorbs at 4010 A.

15020

Yardley, James T. and C. Bradley Moore

LASER-EXCITED VIBRATIONAL FLUORESCENCE AND ENERGY TRANSFER IN METHANE. J. Chem. Phys., Vol. 45:1066-1067, 1966. 10 refs.

The collisional relaxation time for the transfer of vibrational energy from the asymmetric stretch to the bend of methane were measured. Ultrasonic measurements indicate that most polyatomic molecules exchange vibrational energy rapidly among the excited states and lose energy to translation and rotation via the lowest-energy mode. Measurements confirmed this conclusion for methane and yielded stretch to bend rates for comparison to theory.

15032

Sebelev, Igor, J. A. Hayes, Vivian Stannett, and Michael Szwarc

PERMEATION, DIFFUSION, AND SOLUBILITY OF METHYL BROMIDE AND ISOBUTANE IN POLYETHYLENE. Ind. Eng. Chem., 49(3):1941-925, March 1957. 20 refs.

Permeability constants, diffusion constants, and solubility coefficients were obtained for methyl bromide and isobutane vapors in polyethylene. The results are presented in the form of permeability isobars and permeability and sorption isotherms. The temperature dependence of the permeability constants for methyl bromide is shown for three different pressures: 100 mm, 300 mm, and 600 mm of mercury. The isobars corresponding to higher pressures depart markedly from the normally observed linear relationship, the permeability constants first decreasing and then increasing as the temperature is progressively lowered. A similar behavior is observed in the permeation of isobutane. The minima of these isobars are shifted toward lower temperatures as the pressure is decreased, and at sufficiently low pressure, e.g., 100 mm, normal linear plots are obtained across the whole temperature range covered. At lower temperature both diffusion constants and solubility coefficients depart from normal linear relations. The

diffusion constants are concentration-dependent and the activation energy required for diffusion decreases with increasing constant relative vapor pressure. The solubilities of constant relative vapor pressure are independent of temperature, indicating that lowering the temperature at constant pressure leads to the same sequence of effects as increasing the pressure at constant temperatures, i.e., in a proper scale the isobar at variable temperature is identical with the isotherm at variable pressure. Hence, the rapid increase in the solubility coefficient at constant pressure and variable temperature reflects the steep slope of the sorption isotherm.

19068

Buhsenan, R. and P. L. Charlesworth

THE THERMODYNAMIC EFFICIENCY OF GAS SEPARATION PLANTS. Brit. Chem. Eng., 11(8):839-842, Aug. 1966. 3 refs.

The sources of inefficiency in gas separation units are analysed. Variations in column pressure accompanied by other modifications can affect thermodynamic efficiency. However, the principal causes of low thermodynamic efficiency are difficulty of cold recovery and the irreversibility of the distillation columns. This is due to the large temperature differences between the top and bottom ends of columns fractionating the multicomponent mixtures encountered in low temperature hydrocarbon separations. To improve efficiency and reduce the utility consumption of hydrocarbon gas separation plants, a higher degree of cold recovery should be achieved wherever possible. Temperature differences between the ends of the columns should be decreased. The circulation rate of refrigerants should be reduced as far as possible. The amount of the higher boiling refrigerant which must be compressed to a sufficiently high pressure to allow it to be condensed against cooling water should be minimized. The steps to improve thermodynamic efficiency in two of a different design plants, one high pressure, the other low pressure, are described. Although the efficiency of the high pressure plant is considerably greater than that of previous variants, power consumption is still high. This is partly due to the fact that the ethylene product is made available at an elevated pressured and that a portion of it is supplied as liquid. The power consumption of the low pressure plant is considerably lower than the high pressure plant. Other features of the two plant designs will have to be compared from both practical and economic viewpoints before a design preference is made.

19055

Eisenthal, K. B., M. L. Pettinian, and K. E. Rieckhoff

LASER-INDUCED LUMINESCENCE AND DISSOCIATION IN BIPHENYL. J. Chem. Phys., 44(12):4689-4697, June 15, 1966. 16 refs.

The interaction of the radiation field of an unfocused ruby laser with molecules containing a phenyl-phenyl or benzyl-benzyl single bond gave rise to a new luminescence. This luminescence is linearly dependent on the molecular concentration and proportional to either the second or the third power of the laser intensity. Thus it appears that a multiphoton absorption is

occurring. The absorption does not appear to involve the electronic states of the molecules. This luminescence occurs throughout the visible region and bears no resemblance whatever to either the normal fluorescence or phosphorescence. Because of the exceedingly high laser intensities or electric fields necessary for electronic dielectric breakdown it appears that this mechanism is not of importance. It is suggested that multiphoton vibrational excitation to a dissociative state of the molecule may occur which leads to molecular fragmentation. This process is followed by a chemiluminescent emission. A quantitative comparison of the experimental results with a theoretical treatment of multiphoton vibrational dissociation is made. (Author abstract modified)

15063

Beams, J. W. and C. Skarstrom

THE CONCENTRATION OF ISOTOPES BY THE EVAPORATIVE CENTRIFUGE METHOD. Phys. Rev., vol. 56:266-272, Aug. 1, 1939. 10 refs.

The air-driven vacuum-type tubular centrifuge was used for the separation of the isotopes of chlorine by the evaporative centrifuge method. The separations obtained were about the same as predicted by the theory provided that experimental conditions approximately conformed to the assumptions of the theory. With a steel tube 11 in. long and 3 in. inside diameter, containing baffles to prevent rotating, and spinning at 1060 rps, carbon tetrachloride vapor was withdrawn from the axis at the rate of 3.2 grams per minute without decreasing the separation factor. This separation factor for chlorine, which at any instant is the ratio at the periphery, was 1.025 in the above case. It is believed that the method is practical in the case of the heavier elements, but inferior to other centrifuge methods where large concentrations of the isotopes in smaller quantities of material are used. (Author abstract modified)

15074

Li, N. N. and E. J. Henley

PERMEATION OF GASES THROUGH POLYETHYLENE FILMS AT ELEVATED PRESSURES. Am. Inst. Chem. Engrs. J., 10(5):666-670, Sept. 1964. 16 refs.

The permeability of polar and nonpolar gases (methane, ethane, propane, butane, ethylene, Freon-12, carbon dioxide, and nitrous oxide) in polyethylene film was studied at 15 to 40 C and film pressures to 11 atm. The effects of film thickness, temperature, and upstream and downstream pressures on gaseous permeation were determined. Carbon dioxide permeation through polyethylene obeys both Henry and Fick's laws. When upstream and downstream pressures are maintained at 1.57 and 1.0 atm, the permeation constant CO2 is temperature dependent, obeying the usual Arrhenius type relationship. The permeabilities of methane, ethylene, ethane, propane, butane, NO, and Freon-12 are pressure dependent, and the activation energies of these gases are functions of pressure. The observed correlation between

permeability and increased pressure is further evidence of the strong plasticizing effect exerted by organic and inorganic polar vapors and gases. Both solubility constants and gas diffusivity are shown to be functions of pressure. Tested film thickness of 1, 2, 3, and 10 mil have no effect on the permeation constant. The effect of pressure on permeability is expressible by an exponential equation. The solubility constants of pressure-dependent gases can be correlated by a similar exponential equation, while diffusivity is calculated from permeation and solubility constants.

15078

Rutkiblil, J. H., H. P. Haynes, S. Katell, and G. B. Taylor

COST ESTIMATES OF PROCESSES FOR SEPARATING MIXTURES OF METHANE AND HYDROGEN. Bureau of Mines, Washington, D. C., RI 6530, 43p., 1964. 42 refs.

Capital and operating costs were estimated for separating methane and hydrogen in gas-separating plants designed to produce 90 million standard cu ft per day of product gas containing a minimum of 90 percent methane. After a preliminary literature review of various separation techniques, three different processes moving-bed adsorption using active carbon, oil absorption, and liquefaction were chosen for the cost estimates. Three different methane feed gas concentrations, 5, 20, and 50 percent were chosen as representative methane concentrations for the separation estimates. Capital and operating costs were lowest for the moving-bed adsorption process in all three cases investigated. Operating costs (1964) declined from 80.25 to 80.06 per 1000 cu ft of product gas, and capital costs declined from $57,490,000 to $7,411,200 as the percentage of methane in the feed gas increased from 5 to 50 percent. (Author abstract modified)

15085

Nelson, A. W.

CRYOGENICS IN GAS PROCESSING. Oil Gas J., 63(26):96-100; 102, June 28, 1965.

Recent developments in the cryogenic processing of natural gas are reviewed. Cryogenic technology is distinguished by its insulation techniques, the most widely known of which is the cold box; by its specialized metallurgical requirements, which depend on the use of various modified steels; and by the need for particularly high thermodynamic efficiency. The technical features of the helium recovery process, presently the greatest use of cryogenics in natural gas processing, are explained, and a flow diagram of the operation is given. Because helium plant construction is diminishing, interest in the cryogenics of liquefied natural gas (LNG) is increasing rapidly, with emphasis on peak-shaving and ocean transportation operations. In LNG plants, interest has centered on cascade-type systems; such a system using propane, ethylene, and methane as the cascading refrigerants is described. The recently-developed use of an expansion-engine cycle in conjunction with existing pressure-letdown situations to provide refrigeration for natural

gas liquefaction is also considered, with reference to its application in a simple Claude cycle. The economic and technical aspects of using the cold from LNG revaporization in the liquefaction of industrial gases for distribution is currently under study. Another potential application of cryogenics in the gas industry is the reduction of the nitrogen content of natural gas; nitrogen-rejection techniques have been developed in helium recovery plants and may change the status of gas fields that are not considered economic at present because of high nitrogen content.

19088

Korving, J., H. Hulsman, H. F. P. Knaap, and J. J. M. Beenakker

THE INFLUENCE OF A MAGNETIC FIELD ON THE VISCOSITY OF CH4 AND CF4 (ROUGH SPHERICAL MOLECULES). Phys. Letters, 17(1):33-34, June 15, 1965. 11 refs.

An experimental determination of the influence of a magnetic field on the velocity of CH4 and CF4 is reported. The classical picture of the phenomenon for nonspherical molecules is that the magnetic field gives rise to a precession of the magnetic moment of the molecule around the field direction. A more fundamental description is given in terms of the distribution function of the velocities and angular momenta of polyatomic molecules. The change in the viscosity of CH4 and CF4, which are regarded as rough spherical molecules was measured, and a change was found for both gases. Results show that viscosity change is a function of the magnetic field/pressure. A theoretical treatment of viscosity and heat conductivity in a gas of rough spherical molecules was undertaken by solving the Boltzmann equations containing a magnetic field term. The rough-spherical model has the advantage over the ovaloid model in that the collision process is completely specified.

19104

Nicholas, Alan S., Wolf H. Vieth, and James A. Barrie

DIFFUSION OF GASES IN POLYETHYLENE TEREPHTHALATE. J. Appl. Phys., 36(1):13-20, Jan. 1965. 16 refs.

Diffusion of helium, oxygen, nitrogen, argon, carbon dioxide, and methane in glassy and rubbery polyethylene terephthalate was studied in the range of 25 to 140 C. Despite the abnormal solution behavior of these gases in the glassy polymer, the diffusion process is evidently normal and Fickian. Correlation of solubility constants for oxygen and nitrogen, obtained by the time-lag method, with data obtained by a static sorption method, indicates that glassy crystalline polyethylene terephthalate may be considered an isotropic diffusion medium. Diffusion is impeded purely geometrically by the presence of the crystallites, and the impedance factor is equal to the reciprocal of the amorphous volume fraction. In the rubbery crystalline state of the polymer, diffusion is Fickian and apparent activation energies for diffusion are larger than those in the glassy crystalline polymer. A model for diffusion in the glassy

amorphous and crystalline polymers is proposed, assuming that the driving force for diffusion is the concentration gradient of dissolved molecules which are assumed to be in local equilibrium with molecules in the 'holes.' The model predicts that actual diffusion constants and activation energies are larger than those experimentally measured. Thus, part of the observed difference between values of the activation energy in the glassy and rubbery states may be reconciled. Correlations of diffusion and activation energy with the square of gas molecular diameters are obtained in both the glassy and rubbery states. In the latter plots, the helium data fall above the correlations, showing evidence of partially nonactivated diffusion in both states of the polymer. (Author abstract modified)

15119

Munn, A. H.

LASER-INDUCED INFRARED FLUORESCENCE. J. Chem. Phys., vol. 40:511-513, 1964. 2 refs.

Fluorescence was detected from ethylene, SF_6, NH_3, CH_3N_3, CD_3I, D_2S, CH_3NH_2, CH_3N and C_2H_5Cl at low pressures when irradiated by a 50-W CW CO_2-N_2-He laser. The apparatus used consisted of a commercial CO_2 laser as a pumping source and an infrared grating spectrometer for detection. Ethylene absorbed all of the laser lines and promoted a considerable number of molecules to the seventh excited state. Redistribution of the excited molecules to all rotational states in the vibrational band by thermalizing collisions is very rapid at a pressure of 50 mm Hg and is on the order of 0.1-10 microsec. Vibrational relaxation is much slower, approximately 0.1-10 millisec; hence, emission occurs in most rotational transitions in the band. The only exception appeared in the emission spectrum of NH_3. The emission spectrum shows some intensity deviations from the absorption spectrum in that all emission lines originating from a states are slightly more intense than those from s states. The overtone transitions are also more intense in the emission spectrum. It may be that the fundamental transition is absorbing the laser's power, thus causing fluorescence from all a and s states at the same time. Although the mechanism of emission is not fully understood, the efficiency of collisional transfer is sufficient to populate a total vibration-rotation band when only a few of its members are strongly saturated.

15125

Gilliland, E. R., E. F. Baddour, and H. H. Engel

FLOW OF GASES THROUGH POROUS SOLIDS UNDER THE INFLUENCE OF TEMPERATURE GRADIENTS. Am. Inst. Chem. Engrs. J., 8(4):530-536, Sept. 1962. 34 refs.

The isothermal and isobaric flow of pure gases and vapors through microporous Vycor glass was investigated under such conditions that the gas-phase flow occurred by Knudsen diffusion. The isothermal flows and the isobaric flow of nonadsorbed gases are

correlated by existing relationships. On the assumption that surface flow is a diffusive process and that equilibrium exists between the vapor and solid throughout the porous media, a correlation for the nonisothermal surface flow is developed. The factors determining the rate of surface flow are the physical properties of the solid, the temperature level and gradient, the enthalpy of adsorption, the surface concentration and spreading pressure of the adsorbed phase, and the activation energy and coefficient of resistance for surface diffusion. The latter two factors can be evaluated from isothermal surface flow measurements; hence no new arbitrary constants are required in the correlation. Agreement between predicted and measured surface flows is good for ethylene and propylene at a mean temperature of 25 C. Both the gas-phase and surface flows are from the cold to hot end of the porous solid. It is suggested that the use of temperature gradients in porous solids and plastic films for separating mixtures of vapors be investigated. (Author abstract)

15131

Barrer, R. M.

SOME PROPERTIES OF DIFFUSION COEFFICIENTS IN POLYMERS. J. Phys. Chem., 61(2):178-188, Feb. 1957. 62 refs.

Recent developments in sorption and diffusion in some polymers are reviewed. The five diffusion coefficients characteristic of any binary mixture can all be obtained in penetrant-polymer mixtures, but past measurements in a variety of systems have probably given erroneous diffusion coefficients (D) because it was only recently realized that the diffusion coefficients are a function of time as well as of concentration. Present methods of interpretation cannot allow for simultaneous time and concentration dependence of D. For this reason the most reliable results refer to elastomer-penetrant systems, where time effects are at a minimum owing to short relaxation times of polymer molecules. For the same reason, in polymers exhibiting less chain mobility and stronger inter-chain bonds, the steady-state methods of measuring diffusion coefficients are preferable to transient state procedures. A classification of penetrant-polymer systems is given, with examples of each category. Factors influencing the concentration dependence of D are discussed, and also the experimental observations leading to the zone theory of the diffusion mechanism and the quantitative formulation of this theory. Relations between viscous resistance and diffusion are indicated, and generalized functional relationships are considered. Selectivity in the transmission of molecules through organic membranes is also considered. (Author abstract modified)

15134

Haines, H. and B. V. Eyre

MULTIPLE REFRIGERANTS IN NATURAL GAS LIQUEFACTION. Chem. Eng. Progr., 53(6):62-67, June 1957.

Three types of cascade cycles for liquefying natural gas in large-

separate plants are described. A standard expander cycle which consists of a succession of refrigeration cycles and utilizes propane, ethylene, and methane refrigerants in closed loops, has certain high-cost and complex operational drawbacks. The dual-refrigerant cycle represents a simplification of the standard cycle by combining the ethylene and methane refrigerant cycles into one group. The development of the autorefrigerated cascade (ARC) cycle was a further refinement of the liquefaction process. The principle of this cycle is still one of refrigeration transfer from cooling water to decreasing temperature levels, as with the other cycles, but the refrigerant consists of a single mixture having a composition which allows the partial condensation at any one state to correspond exactly to the refrigeration requirements of the next stage. The partial condensations of the refrigerant take place at one pressure level corresponding to the high pressure of the cycle, while the vaporizations occur at a single low pressure corresponding to the cycle compressor suction pressure. The refrigerant used in the process is a mixture of nitrogen and hydrocarbons. Flowsheets and detailed descriptions of each of the cycles are presented, as well as a discussion of the thermodynamics involved. The advantages of the ARC cycles over the others favor its application whenever multiple-refrigerant cycles are considered for the liquefaction of natural gas. These advantages include low over-all investment, flexibility of operation, efficient use of installed horsepower, ease of maintenance, no requirement for the purchase of costly high-purity refrigerants, and constant availability of the total amount of refrigeration in different sections of the cycle.

19159

Tiffany, W. B.

SELECTIVE PHOTOCHEMISTRY OF BROMINE USING A RUBY LASER. J. Chem. Phys., 48(7):3019-3031, April 1, 1968. 46 refs.

Gas-phase photochemical addition of bromine to olefin molecules was studied by inducing the reaction with monochromatic light near 6940 Å from a pulsed, tunable ruby laser. All previous photochemical reactions of bromine were induced with light at wavelengths shorter than 5000 Å, and were found to proceed by means of free radical chains. The Br atoms initiating these chains are produced by direct dissociation of Br_2 molecules upon absorption of light in the continuum. The present investigations show that free-radical chains are responsible for the reaction at 6940 Å, also. However, direct dissociation at this wavelength is found to be negligible, and the Br_2 molecules are excited to individual bound levels 500 to 800 cm^{-1} below the dissociation energy. Kinetic and isotopic evidence shows that the additional energy is furnished by subsequent collisions, so that about 1% of the excited Br_2 molecules become dissociated and can initiate the reaction. The remaining excited Br_2 molecules relax by collisions to the ground state at a rate somewhat higher than the gas-kinetic-collision rate. It was shown that selective laser excitation provides information about dynamic molecular processes which is not easily obtained using other methods. (Author abstract modified)

15183

Michaels, Alan S. and Harvin J. Bixler

SOLUBILITY OF GASES IN POLYETHYLENE. J. Polymer Sci., 50(154): 393-412, 1961. 22 refs.

The solubility constants for thirteen permanent gases were measured from the 0-55 C in a linear and branched polyethylene, hydrogenated polybutadiene, and natural rubber. Equilibrium and time lag solubility determinations were made and were in agreement. The solubility of each gas in polyethylene was proportional to the volume fraction of amorphous material when the polymer was treated as a simple, two-phase mixture of crystalline and amorphous polymer, each with a characteristic specific volume. A solubility constant in completely amorphous polyethylene was determined for each gas which, with the density of an arbitrary sample, enabled calculation of the solubility of each gas in that particular sample. A correlation of the solubility constants in completely amorphous polyethylene was obtained from a thermodynamic model of the dissolution process. The solubility constants in natural rubber, a completely amorphous polymer under the experimental conditions, were approximately 50% higher than those in amorphous polyethylene. Higher intermolecular forces due to the unsaturation in natural rubber may account for this result. The apparent heats of solution of all gases in branched polyethylene were approximately 1.0 kcal/g mole more positive than those in linear polyethylene. This behavior was the result of crystalline melt-out in branched polyethylene. In linear polyethylene the experimental solubility data yielded essentially true heats of solution, since negligible crystalline melt-out occurred between 5 and 55 C. These were correlated by the thermodynamic model for the dissolution process. Available evidence indicates that the crystallites in polyethylene are impenetrable, and are randomly distributed on a macroscopic scale with respect to the diffusion and dissolution processes. The amorphous phase behaves as a homogeneous liquid whose thermodynamic properties are independent of the mode of polymer preparation, thermal history of the sample, and level of crystallinity. (Author summary modified)

15185

Michaels, Alan S., Harvin J. Bixler, and Harvey L. Fein

GAS TRANSPORT IN THERMALLY CONDITIONED LINEAR POLYETHYLENE. J. Appl. Physics, 35(11):3165-3176, Nov. 1964. 16 refs.

The sorption and diffusion of helium, argon, and ethane, and their temperature dependencies were measured in a series of linear polyethylene films previously subjected to widely differing conditions of cooling from the melt and to subsequent annealing at elevated temperature. The results indicate unexpected effects of thermal history on crystalline morphology. Rapidly cooled polymer, after annealing at 130 C, exhibited significantly higher permeability to all gases than slowly cooled polymer, suggesting that the permeability of linear polyethylene is not uniquely determined by level of crystallinity, but depends also on the path by which such crystallinity is developed. Irrespective of thermal history and crystallinity level, solubility

constants and heats of solution of argon and ethane were normal, varying linearly with amorphous volume fraction. Diffusion activation energies for these gases were also independent of thermal history. The solubility constants of helium were anomalously high, and dependent on both thermal history and level of crystallinity. With helium, anomalous temperature variations of diffusion constants were observed with films in which solubility was anomalous. The peculiar sorption and diffusion behavior of helium implies that helium is capable of slow diffusion into, and occupancy of, defects or voids within the crystalline structure from which larger gas molecules are excluded. The 'chain immobilization factors' for argon and ethane are thought to be a size-controlled impedance to diffusion. They arise from the extremely small dimensions of the diffusional paths in highly crystalline polymer.

15167

Carter, J. W.

ADSORPTION PROCESSES. Chem. Process Eng., 47(9):70-77, Sept. 1966. 12 refs.

Adsorptive capacity and, to a lesser extent, the effective diameter of the internal pores of an adsorbent are important variables influencing the choice of adsorbents for particular separation problems. For drying gases or liquids at low temperatures, molecular sieves are advantageous in their higher capacity. This is particularly the case when drying organic liquids or vapor mixtures of hydrocarbons and other organics. Molecular sieves are also suitable for adsorbing organic compounds such as hydrogen sulfide, carbon oxysulfide, and sulfins at relative low humidities. At high relative humidities, the ultimate capacity of silica gel and activated alumina are higher. Empirical or semiempirical methods must be used to estimate the quantity of absorbent necessary and the dimensions of a suitable absorber bed. Flow and pressure drop requirements of the bed and of the regenerating circuit must also be computed. Predicting the performance of fixed-bed adsorbers is difficult because adsorption processes involve a number of interacting mechanisms. Mathematical treatments can give no more than a guide to the best practice. Numerical methods of solution involving high-speed digital computation are required to explain the influence of these mechanisms.

15161

Michaels, Alan S., Wolf R. Vieth, and James A. Barrie

DILUTION OF GASES IN POLYETHYLENE TEREPHTHALATE. J. Appl. Phys., 34(1):1-12, Jan. 1963. 19 refs.

The solubilities of helium, nitrogen, oxygen, argon, methane, carbon dioxide, and ethane in glassy amorphous and crystalline polyethylene terephthalate were studied by time-lag and/or static sorption methods. Solubilities of all the gases but ethane were also determined in the rubbery crystalline polymer. The only deviations from Henry's law were displayed by ethane at 25 C and carbon dioxide at 25 and 50 C in the glassy polymer.

Correlations of solubility constants for oxygen and nitrogen obtained by the static sorption method with values obtained dynamically indicate that the glassy crystalline polymer is an isotropic diffusion medium. Sorption in the glassy amorphous and crystalline polymers generally takes place by two processes operating concurrently: ordinary dissolution plus 'hole-filling.' Crystallinity reduces gas solubility in the glassy polymer, but not generally in direct proportion to the decrease in amorphous volume. An exception is helium. The glassy state of the partially crystalline polymer extends to about 80-85 C where a transition region is noted on a van't Hoff plot for solubility constants. The other extremity of this region (about 95 C) marks the onset of rubber-like behavior in the polymer. Heats of sorption in the glassy crystalline polymer are more exothermic than in the rubbery crystalline polymer, characteristic of the transition from sorption by dissolution and void-filling processes to dissolution alone. The heat of solution of helium is slightly positive in both the glassy and rubbery states of the crystalline polymer. It appears that the major contribution to helium sorption in either state of the crystalline polymer is ordinary dissolution. In both the glassy and rubbery states, carbon dioxide shows evidence of a polar interaction with the polymer. Solubility constants are correlated with gas force constants in both the glassy amorphous and rubbery crystalline polymers. (Author abstract modified)

1518A

Michaels, Alan S., Raymond P. Baddour, Harris J. Bixler, and E. Y. Chou

CONDITIONED POLYETHYLENE AS A PERMSELECTIVE MEMBRANE. Ind. Eng. Chem. Process Design Develop., 1(1):14-25, Jan. 1962. 16 refs.

The purposes of the investigation were (1) to measure the rates of transmission of xylene isomers through conventional polyethylene films under controlled conditions; (2) to condition polyethylene films by heating the polymer in the presence of selected isomers, followed by cooling; and (3) by measuring the isomer transmission characteristics of the conditioned films, to establish whether the conditioning process has any significant effect on either film permeability or permselectivity to the isomers. By swelling polyethylene film in p-xylene and annealing the film at an elevated temperature in the swollen state, it was possible to increase the xylene liquid permeation rate through the film and the permselectivity of the film to p- with respect to m- and o-xylenes. Permeability and permselectivity changes are highly dependent on the degree of swelling, the treatment temperature, polymer crystallinity, and the treating compound. Alteration of the crystalline texture of the polymer is believed responsible for the observed effects. This technique of tailoring a polymeric membrane to render it more effective as a separation barrier appears to open new prospects for the utilization of membrane permeation as a practical mixture separation method.

1518J

Kammermeyer, Karl and Darrell D. Myrick

EFFECT OF ABSORPTION IN BARRIER SEPARATION. Ind. Eng. Chem., 50(9):1309-1310, Sept. 1958. 12 refs.

Separation experiments were carried out with mixtures of propane and carbon dioxide in flow through porous glass as the microporous barrier to determine if porous barriers are affected by the differences in the adsorbability of the components. The experiments show that components of essentially equal molecular weight can be separated on the basis of differences in adsorption on a microporous barrier. Mixtures of propane and carbon dioxide gave appreciable enrichment in propane, the more condensable component, entirely on the basis of adsorbed flow. It is concluded that mixtures can be effectively separated with barriers by utilizing differences in the adsorbed flow of the components by proper adjustment of operating conditions. Studies are under way to establish the degree of adsorption of propane and carbon dioxide on the porous glass barrier under the conditions of the separation experiments.

15198

Haddour, Raymond F.; Alan S. Michaels, Harris J. Bixler, Richard F. De Filippi, and James A. Barrie

TRANSPORT OF LIQUIDS IN STRUCTURALLY MODIFIED POLYETHYLENE. J. Appl. Polymer Sci.; 8(2):897-933, 1964. 20 refs.

The mechanism responsible for changes in film properties was investigated and the structural aspects of a crystalline polymer that affects liquid sorption and diffusion were determined. Cast linear polyethylene films subjected to dry and solvent annealing display markedly different sorption and diffusion barrier properties than do untreated films. The subsequent sorption of liquid o- and p-xylene and cis- and trans-acetylene dichloride per unit volume of amorphous polymer increases as the annealing temperature and/or treating solvent concentration increases. Integral diffusivities calculated from sorption and steady-state permeation rates show a monotonic increase with sorption per unit volume of amorphous polymer. The concentration dependence, however, is less marked than observed in similar systems at low permeant activity. Apparently the treatment reduces the effective crosslinking imposed by the crystallites on the amorphous polymer chains through disentangling and incorporating some of these chains into crystallites. Thus the polymer is capable of a greater degree of swelling when brought into contact with a compatible liquid in spite of a higher degree of crystallinity. The low concentration dependence of the diffusivities is probably due to heterogeneous distribution of excess permeant in a treated film. If the excess permeant were preferentially sorbed in regions of low polymer concentration, then the above observations could be explained. Long-duration, osmotic stress-induced swelling and recrystallization are cited to account for time-dependent permeation rates in treated and untreated films. (Author summary modified)

15240

Shtern, V. Y.

MECHANISM OF THE VAPOUR-PHASE NITRATION OF ALKANES BY NITROGEN PEROXIDE. Khim. Kinetika, 1964:206-322. 33 refs. Translated from Russian. Ministry of Technology, Orpington, Kent, England.

FTD Reports Center, NIRTECH T 6031, 30p., Feb. 1969.
DDC: AD 689718

To determine the optimum conditions for obtaining nitro products by the nitration of alkanes, the kinetics and mechanism of the thermal nitration of methane and propane were studied. A glass vacuum apparatus with a conventional cylindrical reactor was used for the experiments in which slow reactions, cold-flame, and hot-flame reactions were observed. Only nitromethane, carbon oxides, hydrogen, and water were found in the products of the slow reaction of methane nitration. In addition to these products, the cold-flame reaction yielded formaldehyde and ethane. The hot-flame reaction lead to the appearance of ethylene and to an increase in the ethane and hydrogen content. The main products of the slow reaction of propane nitration were nitro-alkanes and carbon oxides. Methane and hydrogen were not present. The main products of the cold-flame reaction were carbon oxides, olefins, formaldehyde, and methane. The hot-flame reaction decreased the yield of alkenes and carbonyl compounds, increased the carbon oxides, and yielded hydrocyanic acid. The mechanism of alkane nitration is a branching chain reaction that can simulate an unbranching chain reaction when chain discontinuity predominates over the branching. Chain formation is linked with the formation of excited alkyl nitrite whose almost instantaneous decomposition, with the formation of the alkoxyl radical RO, makes possible the further development of the chain. Branching is a result of the reaction of aldehyde with NO2. Instead of the formation of two or three free valencies, the formation of the active acyl radical, RCO, occurs in the course of branching.

15243

Meijer, R. J.

THE PHILIPS-STIRLING ENGINE. (Der Philips-Stirlingmotor). Text in German. Motortech. Z. (Stuttgart), 29(7):206-295, July 1968. 14 refs.

The development of the Philips-Stirling engine is described and its advantages are enumerated. The engine is based on the principle of moving gas back and forth between a hot chamber and a cold chamber by a displacement piston. Development of the Stirling principle began in 1938 in the Philips research laboratories with the construction of small hot-air engines. Through the invention of the double acting engine, the path to larger Stirling engines was opened. Development of the rhombic gear in 1951 permitted operation with a pressureless crankcase. Hydrogen and helium replaced air. The engine efficiency could be raised to 30%, the specific power to 110 hp referred to the piston displacement volume. Better gaskets improved the longevity of the engine. The problems of thermal tension and heat transfer have been solved. Laboratory models of 10, 50, and 90 hp per cylinder have been built and tested while experiments on a model with 400 hp per cylinder are under way. A Stirling engine performs as well as or even better than a diesel engine. If the Stirling engine is driven with a fossil fuel, the exhaust gases are quite clean. They contain no CO or hydrocarbons owing to a steady combustion in a chamber fenced in by hot walls. Concentrations of NO and NO2 are low. A table comparing the exhaust gas composition of the Stirling engine with a gas turbine indicates this quite clearly. The reason for the reduction in emissions is not fully understood since flame

temperatures in the burner are very high. To study the relationship between the temperature of the preheated air and the NOx content, an electrically driven air preheater was installed in a 90 hp one-cylinder engine. It was found that the NOx content decreases with decreasing temperature of the preheated air. If part of the exhaust gas is returned to the combustion air, the NO content can be further reduced.

15265

Michaels, Alan S. and Harris J. Bixler

FLOW OF GASES THROUGH POLYETHYLENE. J. Polymer Sci.; 50(154):413-439, 1961. 17 refs.

Diffusion and permeability constants for twelve permanent gases were measured in a linear and a branched polyethylene, hydrogenated polybutadiene, and natural rubber from 5-55 C. The time-lag method was used in the determinations. For all gas-polymer pairs investigated, a linear plot of the logarithm of the diffusion or permeability constants a the reciprocal absolute temperature exists, indicating the occurrence of activated diffusion. Arguments are presented supporting the hypothesis that natural rubber is a completely amorphous analog of polyethylene with respect to the diffusion process. The reduction in diffusion constants is to quantitatively express in going from natural rubber to hydrogenated polybutadiene (29% crystalline), to the branched polyethylene (41% crystalline), and to the linear polyethylene (77% crystalline). These reductions were strongly dependent on gas molecular size, increasing as the molecular size increases. A geometric impedance factor and a chain immobilization factor are introduced to account for the effect of crystallinity. The former is assumed to be independent of molecular size; it explains the necessity of the diffusing molecule to bypass crystallites which are shown to be impenetrable. The latter size-dependent factor reflects the reduction in amorphous chain segment mobility brought about through the proximity of crystallites. Analysis of the geometric impedance factor supports the existence of thin, highly anisometric sheets of crystalline polymer in polyethylene. The anisometry of the crystallites increases with increasing crystallinity consistent with the chain folding mechanism for crystal growth in polyethylene. Nucleation and growth kinetics also account for the variations in crystal anisometry observed in polymers prepared by different methods of polymerization. The apparent activation energies for diffusion determined in polyethylene include not only the energy required for chain segment separation, but also the effect of thermal expansion and crystallite melting. Correlations are presented which permit the estimation of gas diffusion constants in a wide variety of polyethylenes. (Author summary modified)

15274

Shapiro, Hyman, Earl George De Witt, and Jerome Engel Brown

ENGINE FUELS WITH THE BOILING POINT OF THE GASOLINE CONTAINING A CYCLIC MANGANESE TRICARBONYL COMPOUND. (Motorentreibstoffe

von Benzolderivaten mit einem Gehalt an einer cyklischen Mangantricarbonylverbindung). Text in German. (Ethyl Corp., New York). U. German Pat. 1,231,050. 5p., Dec. 22, 1966. (Appl. Nov. 19, 1959, 2 claims).

An additive for fuels of the boiling point range of gasolines contain as antiknock agent a cyclic manganese tricarbonyl compound of the general formula $AMn(CO)_3$. The A stands for a cyclic hydrocarbon residue with 5 to 17 carbon atoms including a C_5 group of cyclopentadiene structure. This hydrocarbon residue is bound to manganese with the aid of the carbon cyclopentadiene. The additive is a gasoline soluble compound of an element of the fifth subgroup of the periodic table of elements with the ordinal numbers 15 to 83 at such a quantity that the atom ratio of the added metal to manganese lies between 0.001:1 and 3:1. These additives prevent or at least delay accumulation of large quantities of manganese-containing precipitations between the spark plug electrodes and on the exhaust valves. The concentration of the manganese compounds in engine fuels should preferably range from 0.008 to about 1.585 g/l manganese. To obtain excellent antiknock effects, this concentration should not be exceeded. Antimony is the preferred corrective substance of the fifth subgroup, which contains also phosphorus, arsenic, and bismuth.

19298

Perkin-Elmer Corp., Pomona, Calif.

ANALYTICAL STUDY OF CONTAINMENT AND ATMOSPHERIC SENSOR, PHASE 1. Contract NAS 1-7260, NASA CR-1175, 133p., Sept. 1969.

The Contaminant Atmosphere Sensor is designed to monitor the general condition of spacecraft atmospheres during extended manned spacecraft missions. It is intended to provide information on concentrations of hydrogen, water vapor, helium or nitrogen, oxygen, carbon monoxide, carbon dioxide, methane, and total hydrocarbons. This report presents the results of analyses of the resolutions and sensitivities required to monitor the above compounds in both helium-oxygen and nitrogen-oxygen atmospheres. The basic instrument of the sensor is the Two Gas Analyzer with a ball leak inlet system. This instrument continuously monitors water, nitrogen, oxygen, and carbon dioxide on four fixed collectors. For total hydrocarbon measurement, a collection for m/e 47-120 is added and, for helium oxygen atmospheres, a mass 4 collector is added. Problems encountered in carbon monoxide measurements have been resolved by accumulator cell techniques which permit carbon monoxide to be determined on an intermittent basis. The normal sample gas flow pattern is interrupted to allow the sensor to monitor CO at m/e 28 as it is desorbed from the accumulator cell. The Contaminant Sensor should meet specified performance goals while still having acceptable weight, power, and size.

19305

Dzhanaidinova, N. K.

SIMULTANEOUS MICRODETERMINATION OF CARBON, HYDROGEN, AND URANIUM. (Odnovremennoye mikroopredeleniye ugleroda, vodoroda i urana). Text in Russian. Zavodsk. Lab. (Moscow), 29(10): 1175-1176, 1963.

The possibility of simultaneously making quantitative determinations of carbon, hydrogen, and uranium in 3-5 mg samples of organic uranium compounds was demonstrated. Gravimetric analysis is used and takes advantage of the fact that above 500 C in an oxygen atmosphere, quantitative formation of stable U3O8 takes place, while at 800 C, uranium does not form either the carbide or the carbonyl. The method described takes 35-40 minutes and shows a relative error of 0.3%.

15359

Bunken, H. and H. Winde

INTERACTIONS OF SULFUR DIOXIDE WITH POLAR COMPOUNDS. EFFECTS OBSERVABLE IN THE UV ABSORPTION SPECTRUM. (Wechselwirkungen des Schwefeldioxids mit polaren Verbindungen. Im UV-Absorptionsspektrum beobachtbare Auswirkungen). Text in German. Z. Physik. Chem. (Leipzig), 56(5/6):303-308, Dec. 1967. 5 refs.

The interactions of the sulfur dioxide molecule with ketones, nitriles, esters, chloroform, and alcohols were studied in the UV range between 330 nm and 250 nm. The ketones were boiled with KMnO4 and dried with sodium sulfate and fractionated in a vacuum; carbon tetrachloride(CCl4) and n-octane were shaken with sulfuric acid, neutralized, dried, and fractionated. The SO2 was taken from a steel container and dried with P2O5. Iodimetry was used for analysis of the sulfur dioxide. Considerably different spectra were obtained for the system SO2/propionitrile and SO2/CCl4 or SO2/aliphatic hydrocarbons, although SO2 concentrations were the same in all cases. From the region of longer wavelength to about 296 nm, the extinction coefficient of the sulfur dioxide in solutions of nitriles, ketones, esters, and alcohols is smaller than that in CCl4 solution. At 296 nm, the situation reverses and the extinction coefficient of sulfur dioxide in solutions of the polar compounds is considerably larger than that in CCl4 solutions.

15405

Lasoski, S. W., Jr. and W. H. Cobbs, Jr.

MOISTURE PERMEABILITY OF POLYMERS. I. ROLE OF CRYSTALLINITY AND ORIENTATION. J. Polymer Sci., 36(130):21-33, 1959. 16 refs.

With the three polymers widely different in polarity, the water vapor permeability of unoriented films was shown to increase as the amorphous fraction increased. For polyethylenes, adherence to this relation is exhibited only with structures having densities above 0.94, a range in which the number of short chain branches is low. Films with densities lower than 0.94 exhibit higher film permeabilities than those calculated on the basis of the permeability of the amorphous areas of linear polyethylene. This results from the increase in the number of short chain branches and an increase in amorphous area permeability of the lower density polyethylenes. The variation of water vapor permeability with the square of the amorphous fraction may be theoretically accounted for by a linear variation of the diffusion and solubility coefficients with the amorphous fraction. With polyethylene terephthalate and nylon

&10, the solubility coefficients exhibit this linear relation. The square permeability relation appears to be a limiting case for structures in which crystallization does not impose restraints on the segmental motions important in permeability. Where restraints do occur, as in oriented films, a higher order dependency on the amorphous fraction exists. This was exemplified with biaxially and uniaxially oriented polyethylene terephthalate films, with which it was shown that orientation in oriented crystalline films effects a decrease in permeability in addition to that ascribable to crystallinity. Only those oriented structures in which the orientation is locked-in, as by crystallization, exhibit a decrease in water vapor permeability. The relations of permeability and solubility coefficients to crystallinity have an important utility in that the extent of crystallinity or crystal density may be estimated with the proper data. On the bases of the literature, water vapor permeability data for two high density polyethylenes at three different vapor pressure differentials, the crystal density of polyethylene was estimated to be 0.995, 1.000, and 0.998 or an average of 1.00, in agreement with Bunn's value calculated on the basis of x-ray diffraction studies. (Author summary modified)

19439

Bunken, H. and H. Hicke

INTERACTIONS BETWEEN SULFUR DIOXIDE AND POLAR COMPOUNDS. II. THERMODYNAMIC PARAMETERS OF COMPLEX-FORMING REACTIONS.
(Wechselwirkungen von Schwefeldioxide mit polaren Verbindungen. II. Thermodynamische Grossen der Komplexbildungsreaktionen).
Text in German. E. F. Physik. Chem. Neue Folge (Frankfurt), 58(5/6):348-356, 1968. 4 refs.

The number and stoichiometry of SO2 molecule complexes, as well as the thermodynamic parameters of the respective equilibria, were determined. For this purpose, extinction measurements were taken with the VSU 1 (Carl Zeiss) from -60 C to + 20 C. The complex forming constants were determined from the temperature dependence of the extinction differences of sulfur dioxide in solution with polar compounds in nonpolar solvents (CCl4; 2,2,4-trimethylpentane; and n-C8H18. The systems SO2/n-butanol/CCl4, SO2/isopropanol/CCl4, SO2/2-butanone/n-C8H18, SO2/diethylether/n-C8H18, SO2/n-butanol/2,2,4-trimethylpentane, SO2/acetone/CCl4, SO2/2-pentanone/n-C8H18 were used. The results show that the enthalpies of the SO2/alcohol complexes are lower by 1 kcal/mol than those of the SO2/ketone complexes. In general, the enthalpies are rather low compared to the enthalpy of a hydrogen bridge. The entropies for the SO2/ketone complexes range from -11 to -15 cal/deg mol. Those of the SO2/isopropanol and n-butanol complexes are much lower. The entropy of the SO2/acetone complex is -12.9 cal/deg mol.

19481

Klein, E. P. and V. A. Popov

EXPERIMENTAL INVESTIGATION OF ELECTRICAL CONDUCTIVITY OF PRODUCTS OF COMBUSTION, STIMULATED BY SOLID PARTICLES.
Eksperimental'noye issledovaniye elektroprovodnosti produktov sgoraniya, stimulirovannoy tverdymi chastitsami). Source not

given. Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio. Translation Div., 17p., Aug. 23, 1968. 7 refs. FTD-MT-24-161-68
CFSTI: AD 680511

An experimental study was carried out on the electrical conductivity of the products of combustion of methane with oxygen-enriched air in the presence of solid particles of various substances. By artificially introducing solid particles, the electrophysical properties of the moving gas was improved. Solid particles transported from the combustion chamber may be present in the duct of an open-cycle MHD generator working with products of coal combustion. In addition, when there are sufficiently large temperature reductions in the rear part of the duct, particles may form through the condensation of combustion product volatile directly into the solid phase. Experiments showed that the introduction of particles stimulates the electrical conductivity of the products of methane combustion which, without particles, are nonconducting. The dependence of temperature, particle size, and the relative mass flow rate was studied. A sharp increase in electrical conductivity was noted in the range of 1800-2100 K. The ash content spectrum of particles from natural fuels was investigated. The maximum conductivity was obtained with the introduction of ash particles, while the smallest value corresponded to carbon particles. However, particles of low-ash coals were only slightly inferior from the viewpoint of stimulating conductivity. The dependence of conductivity on ash content was 10%. With a further increase in ash content, the electrical conductivity drops, and for an ash content of 50% a minimum was observed, after which the conductivity increases to a maximum value corresponding to ash. The maximum ash content at 10% is explained by the release of volatile components from the coal. This conclusion is supported by measurements made on coke particles. The electrical conductivity obtained was close to that for pure carbon and differed greatly from that relating to coal.

19409

Woods, F. J., R. E. Westead, and J. E. Johnson

VAPOR-PHASE OXIDATION OF HYDROCARBONS. PART 2 - EFFECT OF OXYGEN CONCENTRATION ON PLATINUM-CATALYZED COMBUSTION AND IONIZATION. Naval Research Lab., Washington, D. C., Chemistry Div., Contract NRL Problem C 01-01, Proj. RR 001-06-41-5850, NRL Rept. 6816, 16p., Feb. 7, 1969. 13 refs.
AD 686072

The catalytic combustion of hydrocarbons was studied with particular attention given to the ionization phenomena associated with it. The greater ion yield of highly branched alkanes relative to straight chain alkanes was confirmed. The effect of the concentration of oxygen in the gas mixture on the extent of oxidation and ionization varied with the hydrocarbon used. In general, increase in O_2 content caused considerable enhancement of the ion yield. However, with some hydrocarbons such as 2,3-dimethylpropane and 2,3-dimethylbutane, the fraction oxidized decreased markedly with increased O_2 concentration in the temperature range, 400-700 C. The data seemed consistent with an explanation based on lower temperature oxidation occurring only on the platinum surface, whereas at higher

temperatures the catalytic process extends itself to some degree into the vapor phase. It is also suggested that dissociative adsorption of O2 at higher temperatures is involved in the ion-producing process. (Author abstract modified)

15491

Novak, J. R. and H. W. Windsor

LASER PHOTOLYSIS AND SPECTROSCOPY IN THE NANOSECOND TIME RANGE: EXCITED SINGLET STATE ABSORPTION IN CORONENE. J. Chem. Phys., 47(8):3075-3076, Oct. 15, 1967. 5 refs.

Laser photolysis apparatus with a spectroscopic source, capable of recording the spectral absorption of transient species in the nanosecond time range, was developed and used to study the first excited singlet state of coronene. Coronene showed a laser line at 387 nm and fluorescence between 410 and 480 nm. Ground state absorption bands of coronene were in the 320-350 nm region. Using both excitation and background pulses, the middle exposure showed heavy bleaching of the ground-state absorption bands and a new absorption in the 500 nm region with a peak at 520 nm. The 520 nm band decayed at the same rate as the fluorescence and was concomitantly replaced by triplet bands growing in at 460 and 390 nm. This was considered unequivocal confirmation that absorption by the S 1 state is responsible for the 520 nm band. This technique is faster by about two orders of magnitude than current flash-spectrographic instrumentation and extends the studies of transient absorption spectra into the nanosecond range. By using calibrated plates or photoelectric recording, kinetic data can be obtained. This technique should have wide application to solid, liquid, and gaseous systems in searching for intermediates of very short life and increasing the understanding of photochemical primary processes.

15574

Curran, George P. and Everett Gorin

PHASE II: BENCH-SCALE RESEARCH IN CO2 PROCESS. LABORATORY PHYSICO-CHEMICAL STUDIES. (Interim Report.) Consolidated Coal Co., Library, Pa., Research Div., OCR Contract 14-01-0001-415, R & D Rept. 16, 58p., 1968. 9 refs.
CFSTI: PB 180719

Basic physico-chemical data important to the development of the CO2 acceptor process are given. Kinetic and integral rate data for lignite char gasification were obtained at 1500 F and 16 atm for two gas inlet compositions. These data show both the strong inhibiting effect of H2 and the catalytic effect of sodium on the gasification rate. The highest sodium content char was the most reactive, but its reactivity was reduced by water extraction to remove the major fraction of sodium. Differential rate data at 1500 F were obtained with a single lignite char at 11 and 16 atm over a wide range of gas compositions. Rates of formation of carbon oxides and methane were measured. Both rates were inhibited by H2 as well as CO. The use of the acceptor showed a favorable effect on the rate of both the carbon steam and methane rates, since the acceptor action reduces the partial pressure

of strongly inhibiting CO. The lignite chars showed an unusually high rate of methane formation with pure hydrogen at temperatures of 1400-1500 F which was suppressed by the presence of a small quantity of steam. Phase equilibrium data from the literature were reviewed, and new data were presented in the binary Ca(OH)2-CaCO3 system. The presence of low-melting eutectics limited practical fluid bed operations to steam partial pressures of 11 atm or below. Agglomerates were formed in the fluid bed above 11 atm, and actual melts were produced above 16 atm. The use of the Ca(OH)2-CO2 system makes either the preparation of synthetic lime or the reactivation of spent lime or dolomite acceptors possible. The reconstituted acceptors are physically strong and their activity is almost equivalent to fresh limestone. Physical studies pointed out that the major cause of activity loss was the growth in size of CaO crystallites. The rapid segregation of the CaO and MgO phases occurred early in the cycling of dolomite acceptors. Acceptors agglomeration in the regenerator occurred when it was operated without char combustion. Microprobe studies showed that it was due to sintering of an outer shell material enriched by Fe, Si, and Al, and was prevented by the addition of ash. (Author summary modified)

1966

Chaika, F. A.

EXPERIMENTAL UNIT FOR *POISONING ANIMALS WITH VISCOUS LIQUID* AEROSOLS. (Eksperimental'naya ustanovka dlya zatravki zhivotnykh aerozolem vyazkikh zhidkostey). Text in Russian. Gigiyena Truda i Prof. Zabolevaniya, no. 8:58-61, 1966. 3 refs.

The device described consists of a vacuum chamber measuring 100 by 70 by 40 cm. A vacuum of 10-15 mm H20 is produced with a Vikhr' vacuum cleaner attached to the base of the chamber. As incoming air stream passes through a mechanical rotary disintegrator, carrying liquid particles into the path of a second air stream entering at the top of the chamber. Aerosol density and particle size are regulated by varying the depth to which the rotating disks of the disintegrator are submerged, and also by varying the rate of rotation. This arrangement is used to inoculate animals with anthracene oil, producing an aerosol concentration of 0.01 to 1.0 mg per liter.

1938

MacFarlane, Walter and Robert Wright

SOLUBILITY OF VAPOURS IN GASES. J. Chem. Soc., 1938:207-210.

The attraction between methyl alcohol, ether, acetone, or chloroform vapors and carbon dioxide, ammonia, sulfur dioxide, or hydrogen chloride gases was studied at average temperatures and pressures by qualitative and quantitative methods. In the qualitative method, used only for methyl alcohol vapor, equal volumes of a gas and air saturated with vapor were allowed to mix, and after equilibrium had been attained, the change of pressure at constant volume was observed. The results indicate that a considerable attraction exists between hydrogen chloride and

methyl alcohol vapors. In the quantitative experiments, liquid was vaporized in a flask containing mercury and gas, after which pressure readings were taken at 15-min intervals for two and one-half hrs. The results were compared by calculating to the common basis of the pressure exerted by 1 gm of vapor in a volume of 100 cc at the temperature of the experiment. The pressures exerted in air are shown to be slightly greater than the theoretical; the pressures exerted in the presence of any other gas are less. In mixtures of hydrogen chloride with methyl alcohol, ether, or acetone vapors, the pressure decreases are marked, indicating considerable attraction between the two constituents of the mixture.

15784

Michael, Arthur and Nathan Weiner

THE MECHANISM OF THE SULFONATION PROCESS. J. Am. Chem. Soc., vol. 58:294-299, Feb. 1936. 10 refs.

The role of sulfuric anhydride in reactions between ethylene and fuming sulfuric acid was studied, and reaction products determined. When the concentration of sulfuric anhydride did not exceed that necessary to form pyrosulfuric acid, one mole of ethionic acid was formed for each mole of pyrosulfuric acid. When anhydride was in excess, methyl sulfate was formed from the reaction mixture in the ratio of one mole to two of sulfur trioxide or to one of S_2O_6. The results demonstrate that the reaction of fuming sulfuric acid with ethylene does not, as proposed, proceed by addition of H_2SO_4 to form isethionic acid. Pyrosulfuric acid adds, like other inorganic acid anhydrides, to ethylene by fission between the anhydride oxygen and sulfur to form ethionic acid. Methyl sulfate is formed in ethylene-fuming sulfuric acid reactions by the addition of the ethene to the H_2SO_4 component of the balanced anhydride system SO_3 in equilibrium with H_2SO_4. Further experiments showed that the product of reactions between isethionic acid and one mole of 100% sulfuric acid, one mole of 100% sulfuric acid and one mole of anhydride, or one mole of anhydride alone is ethionic acid. The product of isethionic acid and two moles of anhydride is methyl sulfate, indicating that isethionic acid is converted to methyl sulfate by the action of two moles of SO_3 or one of S_2O_6. It is concluded that all sulfonic acid syntheses with sulfuric acid proceed by pseudo-substitution involving the addition of a hydrogen and carbon of a hydrocarbon group in the organic compound to the unsaturated oxygen and the attached sulfur of a sulfonyl group. Sulfonation with sulfuric anhydride is interpreted as an aldolization reaction.

15805

Gilbert, Everett E.

THE REACTIONS OF SULFUR TRIOXIDE, AND OF ITS ADDUCTS, WITH ORGANIC COMPOUNDS. Chem. Rev., vol. 62:549-589, 1962. 550 refs.

The reactions of sulfur trioxide and its organic complexes are reviewed with respect to organic compounds through 1960. The preparation and properties of the following complexes

are explained: pyridine, dioxane, trimethylamine, triethylamine, dimethylaniline, thiourea, bis(2-chloroethyl)ether, 2-methylpyridine, quinoline, and dimethylformamide. Reactions with aliphatic and alicyclic compounds are described as with either saturated compounds (hydrocarbons, halogenated hydrocarbons, carboxylic acids, esters, nitriles, ketones aldehydes, alcohols, sterols, glycols, polyether glycols, polyether alcohols, carbohydrates, nitrogenous polysaccharides, ethers, amines, amides, amino acids, proteins, oximes, and hydroxylamines) or with unsaturated compounds (alkyl and aryl ethylenes, cycloalkenes, halogenated ethylenes, vinyl ethers and esters, ketones and aldehydes, alkenoic acids, alkadienes, cycloalkadienes, alkynes, alkenols, and alkynols). Reactions with aromatic compounds are grouped as benzene derivatives (benzene, toluene the xylenes, petroleum oils, polystyrene, halogenated benzenes and alkylbenzenes, amines and anilides, phenolic compounds, aminophenols, mono- and dicarboxylic acids and related compounds, sulfonic acids, nitro compounds, and halosulfonation reactions); naphthalene derivatives (hydrocarbons, naphthylamines, naphthols, and aminonaphthols); and reactions with heterocyclic compounds (furan derivatives, thiophene derivatives, pyrrole and indole derivatives, pyridine, and alkyl pyridines).

15816

Christian, Sherrill D. and Just Grundnes

CHARGE-TRANSFER COMPLEX BETWEEN SULFUR DIOXIDE AND TRIMETHYLAMINE IN THE GAS PHASE AND IN HEPTANE. Nature, vol.216:1111-1112, June 10, 1967. 7 refs.

Spectral and thermodynamic parameters were obtained for a trimethylamine-sulfur dioxide complex in the gas phase at 15-60 C and in heptane at 13-50 C. In sixteen gas-cell experiments at 19.7 C with amine concentrations from 0.0008 to 0.0049 mles/l and sulfur dioxide concentrations from 0.000023 to 0.000059 moles/l, the peak absorbancy of the complex varied from 0.10-0.60 cm. Ultraviolet spectra of the complex were very similar in both phases; spectral parameters and the variation of spectral and thermodynamic constants with temperature were almost identical. Apparently, the mechanisms responsible for the effect of the medium on the spectral characteristics of weaker complexes are not important in this system. The increase in the complex formation constant (Kc) and minus delta H(enthalpy at the standard state) which occurs as the medium is changed from gas to heptane, suggests that this highly polar complex is more strongly solvated than the sum of its uncombined components. Preliminary results indicate that both Kc and minus delta H become even larger in polar solvents.

15888

Hawkes, George W., Lewis R. Drake, and Stephen C. Stowe

REACTION OF SULPHUR DIOXIDE WITH DIOLEFINS AND SEPARATION OF LATTER FROM HYDROCARBON MIXTURES. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,345,050. 7p., Feb. 19, 1946. (Appl. May 15, 1940, 12 claims).

A method for reacting sulfur dioxide with conjugated diolefins to produce crystalline sulfones that are readily decomposed by heat specifically concerns the separation of butadiene-1,3 from mixtures with a butylene or butane. The sulfur dioxide and diolefin material, which should contain at least 0.75 part by weight of sulfur dioxide per part of hydrocarbon, is charged in an autoclave or bomb under pressures sufficient to cause partial liquefication. In its early stages, the reaction takes place between 100-150 C; these temperatures are lowered to about 70 C during the reaction. Heating is continued until the reaction approaches equilibrium between the sulfone product and the sulfur dioxide and diolefin reactants. At 70 C, almost complete conversion of butadiene to the sulfone is achieved. Although the reaction produces an adequate yield of crystalline sulphones without the use of inhibitors, polyhydric phenols can be added to prevent formation of amorphous sulphones. These inhibitors also counteract the tendency of diolefins to undergo partial polymerization at high temperatures. Only a few hours are required to produce the crystalline sulfones. Hydrocarbons are vaporized from the sulfones releasing the pressure and sulfur dioxide by mild heating. The sulfone can be dissociated into the diolefin and sulfur dioxide by more vigorous heating at 120 C or above.

15851

Morton, Frank; F. J. King; and A. McLaughlin

HELICAL-COIL DISTILLATION COLUMNS. PART I: EFFICIENCY STUDIES. PART II: LIQUID FILM RESISTANCE. Trans. Inst. Chem. Engrs. (London), 32(B):S285-S304, 1954. 33 refs.

The operation of helical-coil distillation columns was studied at atmospheric and reduced pressures. A correlation is given for efficiency at atmospheric pressure based on the gas film. The importance of liquid-film resistance is stressed for low pressures; its effect is correlated by an extension of the Higbie equation to flow in helical coils. Operation of the 1.1 cm diameter column at partial reflux under an absolute pressure of 20 mm Hg is discussed. Performances of a number of high-efficiency distillation columns are compared. It is shown that the helical-coil design is particularly useful for low-pressure fractionation of heat-sensitive hydrocarbons and that the efficiency of the column at reduced pressures is not satisfactorily explained solely in terms of the vapor-phase resistance. At atmospheric pressure the helical-coil column does not offer a reasonable alternative to more efficient packings, though its performance is comparable to that of spinning-band and open-tube columns. The liquid film resistance was measured by a carbon dioxide absorption technique and the liquid film coefficients in helical-coils were found to be in general agreement with values predicted for inclined tubes. However, a reason correlation with the experimental resistance data was obtained only when the overall coefficient was calculated on the basis of substantial wetting of the whole surface of the tube. These results imply that the film coefficient is independent of the size of the tube.

15869

Read, Corten F.

METHOD OF REACTING AROMATIC HYDROCARBONS. (Charles L. Norn, Minneapolis, Minn.) U. S. Pat. 2,174,111. 2p., Sept. 26, 1939. (Appl. May 25, 1936, 6 claims).

A method of forming benzene derivatives directly in the presence of an oxide of sulfur, tellurium, and selenium, while controlling the temperature of the reaction to prevent polymerization, is described. The method also provides a means of preparing chlorobenzene substitution products, particularly chlorobenzenes which give a high yield and require a minimum number of steps in its preparation. The method consists of reacting an aromatic hydrocarbon with a vapor mixture of chlorine and an oxide of sulfur, selenium, or tellurium at room temperature. The temperature of the reaction is limited to 70 C. The passage of the mixture into the reaction medium is continued until crystalline products are precipitated.

15872

Latchum, John W. Jr. and James B. Connors

REGENERATION OF ABSORBENT. (Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 2,404,858. 6p., July 30, 1946. (Appl. Dec. 18, 1944, 15 claims).

A method is described for stripping acidic gases, such as sulfur dioxide, from absorbent amine solutions in a dry or moisture-free condition suitable for marketing as dry gases or even for use in cyclic processes requiring dry reagents. The process is especially valuable used in conjunction with solvent extraction processes for removing nitrogen gas from hydrocarbon gases. Acidic gas is separated from the body of the gas mixture by reaction with a diethanolamine or xylidine absorbent. The gas mixture is removed from the absorbent free of the acidic gas. The absorbent is passed through a stripping zone which has an inlet and outlet for the absorbent flow. A vaporous, paraffinic hydrocarbon is passed through the outlet. The hydrocarbon has a boiling point well below the boiling point of diethanolamine. Acidic gas and hydrocarbon is removed from the inlet of the stripping zone. The stripped absorbent is removed through the outlet and recycled into the original contacting step. Acidic gas is removed from the vaporous hydrocarbon as the second product of the process and the hydrocarbon is recycled back to the stripping zone.

15874

McKinnis, Art G.

SOLVENT EXTRACTION. (Union Oil Co. of Calif., Los Angeles) U. S. Pat. 3,350,470. 7p., Oct. 31, 1967. 9 refs. (Appl. Dec. 1, 1961, 8 claims).

A solvent extraction method is described for separating aromatic hydrocarbons from nonaromatic hydrocarbons of petroleum origin. The method comprises a liquid-liquid extration

technique, employing liquid sulfur dioxide and lower alkane solvents, preferably normal alkanes having 5 to 10 carbon length chains. Monomethylnaphthalene is separated from similar boiling monoaromatic and nonaromatic hydrocarbons by contacting the mixture continuously with liquid sulfur dioxide at -20 to 0 C and concurrently with a saturated aliphatic hydrocarbon liquid boiling in the temperature range 95-350 F. A rich extract phase of liquid sulfur dioxide is formed containing part of the hydrocarbon mixture enriched in monomethylnaphthalene. Also formed is a raffinate phase containing the remaining hydrocarbon mixture, the saturated aliphatic hydrocarbon liquid and a small amount of sulfur dioxide. Sulfur dioxide is evaporated from the extract to form a sulfur dioxide overhead product and a hydrocarbon bottom product enriched with monomethylnaphthalene. The sulfur dioxide overhead product is liquified to form liquid sulfur dioxide and recycled. The extraction of 2-methylnaphthalene from a like-boiling hydrocarbon mixture is accomplished in the same way. The method has general application for the preparation of feedstocks for thermal and catalytic dealkylation processes.

15911

Yasuto, Noboru

PHOTOCHEMICAL STUDIES OF AIR POLLUTION. II. STUDIES ON PHOTOCHEMICAL PRODUCTS OF AUTO EXHAUST. (Taiki osen no kokagaku kenkyu (dai 2 ho) jidosha haiki gasu no kosheisha seiseibutsu ni tsuite). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 15(4):246-252, 1969. 5 refs.

Automobile exhaust was irradiated with xenon or solar light under static conditions, and the concentration changes of hydrocarbons, nitrogen oxides, formaldehyde, and irradiation products were analyzed. Hydrocarbon concentrations were determined by hydrogen-flame ionization gas chromatography; nitrogen oxides and formaldehyde concentrations, by colorimetry; and irradiation products, by electron-capture gas chromatography. Irradiation decreased the concentrations of hydrocarbons and nitrogen oxides but increased formaldehyde concentrations. The irradiation products were methyl nitrite, ethyl nitrite, methyl nitrate, ethyl nitrate, n-propyl nitrate, isobutyl nitrate, biacetyl, and peroxyacetyl nitrate. These photochemical reactions of auto exhaust presumably occur in the atmosphere.

15914

Kokurin, A. D.

MECHANISM OF COKE AND CARBON BLACK FORMATION DURING THERMAL PYROLYSIS AND DIFFUSION COMBUSTION. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 42(7):1498-1501, July 1969. 11 refs.

The mechanism of soot formation was studied by pyrolizing various hydrocarbons and their mixtures at 1000-1500 C. At the relatively low temperatures and low heating rates, and with considerable contact time, mainly polycyclic liquid (tarry) products were formed. They were converted to coke by further condensation. Carbon black formed at the higher temperatures as the result of the condensation of C2H and C2 radicals, which are incapable of

forming liquid tarry products. Therefore, the quality of carbon black, i.e., its structure and dispersity, is determined by process conditions and the composition of the raw material. The higher the temperature and heating rate, the greater is the amount of raw material converted to carbon black and the less the amount converted to coke. The quality of carbon black differs in accordance with the degree of participation of radicals and macromolecular liquid products in its formation, the degree of coking, and the contents of impurities, liquid particles, and cokes in the carbon black.

19970

Hyden, L. L. and C. S. Marvel

POLYSULFONES FROM ACETYLENES AND SULFUR DIOXIDE. J. Am. Chem. Soc., Vol. 58:2047-2050, Oct. 1936. 7 refs.

In investigations of the reaction of sulfur dioxide with a variety of substituted acetylenes, monosubstituted acetylenic hydrocarbons were found to combine with sulfur dioxide to give polymeric products. Both monoalkylacetylenes with an alkyl group containing one to five carbon atoms and phenylacetylene combined readily with sulfur dioxide in the presence of alcohol and peroxide-containing paraldehydes. Disubstituted acetylenes did not give this addition reaction. The products of the addition of sulfur dioxide to the monosubstituted acetylenes are presumably polysulfones containing one double bond for each hydrocarbon residue in the polymer. The addition of sulfur dioxide is to the acetylene and not an alkene. The polymers are readily hydrolyzed. Among the phenylacetylenepolysulfone derivatives are benzylmethylsulfone, acetophenone, benzoic acid, and sodium sulfite. Hydrolysis of 1-pentynepolysulfone gave a trace of methyl n-propyl ketone. About 48-50% of the sulfur was removed as sulfur dioxide. The only other hydrolysis product isolated was $C_{10}H_{18}SO_2$. Pyrolysis in boiling dioxane removed half the sulfur from 1-heptynepolysulfone as sulfur dioxide. Phenylacetylenepolysulfone was insoluble in dioxane, but 62-73% of the sulfur was liberated as sulfur dioxide after heating the polymer. Though evidence is still too meager to ascribe definite formulas to acetylene-sulfur dioxide polymers, there is apparently considerable difference between alkyl substituted and aryl substituted products.

19988

Fenimore, George

THE MECHANISM OF CARBON FORMATION. In: Combustion Researches and Reviews 1955. London, Butterworth, 1955, Chapt. 10, p. 198-213. 26 refs. (Presented at the 5th and 7th AGARD Combustion Panel Meetings, Scheveningen, The Netherlands, May 1955 and Paris, Nov. 1955, Agardograph no. 9.)
UPSTI, DDC: AD 68892b

Chemical processes leading to carbon formation in five systems are reviewed and experiments in flash pyrolysis of ketene, acetone, and diacetyl are suggested. The five systems considered are pyrolysis of pure hydrocarbons, pyrolysis of acetylene, diffusion flames, explosion in clouded vessels, and pre-mixed flames. It is contended that previous theories of mechanisms of

carbon formation are incorrect, since they require the intermediate formation of polymeric hydrocarbons. When the time for half reaction is one second or less, the pyrolysis of hydrocarbons results in decomposition, and not polymerization; decomposition leads to the formation of acetylene and hydrogen before carbon formation. These hypotheses are supported by the flash pyrolysis experiments which showed that acetone and diacetyl formed ethylene and acetylene and ketene formed acetylene. Absorption spectra of the reactions occurring during flash pyrolysis of acetylene show the formation of carbon and hydrogen without intermediate hydrocarbon polymers. It is concluded that solid carbon is formed from acetylene by simultaneous combustion and dehydrogenation. Carbon formation in explosions of hydrocarbons with oxygen occurs by pyrolysis of the hydrocarbon in the same way as in the absence of oxygen. The relative rate of this mechanism compared with the oxidation of the hydrocarbon and carbon determines the amount of carbon finally formed. Carbon formation in a diffusion flame occurs by the same pyrolytic mechanism unless the fuel is near to, but less than, 1000 C. Homogeneous explosions are chemically similar to carbon formation in pre-mixed flames. The fact that carbon particles formed during combustion and homogeneous gas-phase pyrolysis are very similar in shape and diameter supports the view that the same mechanism is common to all processes.

15990

Fox, Arthur L., Clyde O. Henke, and Carton F. Reed

PURIFICATION OF HYDROCARBON-SULPHUR DIOXIDE-CHLORINE REACTION PRODUCTS. (Charles L. Horn, Minneapolis, Minn. and DuPont De Nemours (E.I.) and Co., Wilmington, Del.) U. S. Pat. 2,228, 598. 6p., Jan. 14, 1941. (Appl. June 30, 1938, 15 claims).

A process is described for purifying surface-active compounds formed by reacting hydrocarbons, sulfur dioxide, and chlorine and hydrolyzing the resulting product. The invention provides a method of removing water-insoluble oils from the emulsion obtained when hydrocarbons are treated with a gaseous mixture of sulfur dioxide and chlorine and the resulting product is hydrolyzed with a hot caustic alkali. The method is exemplified by the treatment of a hydrocarbon oil with a gaseous mixture of sulfur dioxide and chlorine in the presence of light until the oil gains a certain weight. This product is hydrolyzed and neutralized with a caustic alkali solution. The crude product that is obtained is an aqueous emulsion of hydrocarbon sulfonates, unreacted hydrocarbon, chlorinated hydrocarbon, and salts. This material is purified by diluting with water or a water-soluble organic solvent and removing the water insoluble layer. Purification can also be accomplished by centrifuging without dilution, by extracting the water insoluble portions with a water insoluble organic solvent, by steam distillation, or by a combination of these processes. Many of the products prepared according to the invention have excellent foaming and cleansing properties. These products can serve as intermediates for preparing derivatives useful as plasticizers for paint, varnishes, corrosion inhibitors, gum solvents, extractants for the refining of gasolines and oils, insecticides, detergents, wetting agents, and rewetting agents. They may also be used to improve flotation processes of ores, pigments, coals, etc. and to break petroleum emulsions. Other uses include fungicides, mildew preventives, penetrating agents, and dust collecting agents.

16021

Mascitti, Vincent R.

A SIMPLIFIED EQUILIBRIUM HYDROCARBON-AIR COMBUSTION GAS MODEL FOR CONVENIENT USE IN AIR-BREATHING ENGINE CYCLE COMPUTER PROGRAMS. Virginia Univ., Charlottesville, Dept. of Aerospace Engineering, Thesis (M. Aerospace Eng.), 1967(?), sup. 11 refs.
N69-19694

A simplified hydrocarbon-air combustion gas model was developed for use in engine cycle computer programs. The generalized model reduces to the hydrogen-air system as well as dissociating air. The exclusion of chemical species containing atomic nitrogen allows a considerable simplification of the composition equations. The thermodynamic properties of stoichiometric combustion of the kerosene-air and hydrogen-air systems are computed with the simplified model and are compared with more comprehensive gas models. In addition, the effect of the neglected chemical species on the performance of an idealized subsonic combustion ramjet is presented. The simplified gas model was used to define the limiting conditions for solid carbon and ammonia formation for rich gas mixtures. A computer program listing of the simplified gas model calculation procedure is presented. (author abstract modified)

16027

Blakeway, John Murray and Philip Marshall

SULPHONATION OF ORGANIC COMPOUNDS. (Colgate Palmolive Co., New York) U. S. Pat. 3,248,505. 4p.; Oct. 10, 1967. (Appl. March 15, 1963; 5 claims).

An invention describes the co-sulfonation of sulfonatable organic compounds of different volatilities with sulfur trioxide diluted with an inert gas. Problems arise if the organic compounds are of substantially different volatilities, for such as those which when sulfonated and neutralized are useful as active ingredients in detergent compositions. A high molecular weight alkyl benzene and the diluted sulfur trioxide are introduced in the reaction zone. The more volatile component, a low molecular weight alkyl benzene, and additional diluted sulfur trioxide are added to the reaction zone only after sulfonation of the less volatile component is substantially completed. The point at which the more volatile component is added is not critical. But the earlier this is begun, the greater the risk of losing the more volatile component with the inert gas. The more volatile component is usually introduced when 50% of the less volatile component is sulfonated. The extent of sulfonation is calculated from the amounts of the low molecular weight alkyl benzene and the sulfur trioxide. This invention can be applied to any suitable sulfonating process in which the sulfonating agent is diluted with sulfur trioxide.

16040

Meyer, W. F. and Eric Todd

CRITICAL SOLUTION TEMPERATURES OF SYSTEMS OF SULFUR DIOXIDE AND NORMAL PARAFFINS. Ind. Eng. Chem., vol. 23:325-327, March 1931. 7 refs.

The conditions under which paraffin hydrocarbons (butane, hexane, octane, decane, tetradecane, dodecane, and dotriacontane) are insoluble in liquid sulfur dioxide were investigated. The temperatures defining the limits of miscibility were plotted against both the number of grams of sulfur dioxide in 100 grams of mixture and against the mols of sulfur dioxide in 100 mols of mixture. The curves obtained by plotting miscible temperature against the mol fraction times 100 of the sulfur dioxide were distorted to the right, since the molecular weight of the hydrocarbons were higher than that of sulfur dioxide. Symmetrical curves were obtained when the miscible temperatures were plotted against percent by weight of the sulfur dioxide. The similarity of curves with only one consulute temperature was unwarranted; surface tension measurements indicated that the association is nil or negligible in both hydrocarbons and sulfur dioxide. However, the curves indicate that below the critical solution temperature the solubility of sulfur dioxide in the hydrocarbon is greater at the same temperature than the solubility of the hydrocarbon in the sulfur dioxide. The curve of molecular weight of hydrocarbons vs critical solution temperature indicates that molecular weight is a factor in determining the critical solution temperature point; it must be considered in any attempt to deduce a general equation defining miscibility limits in a binary system. It is also shown that the amount of hydrocarbon soluble in sulfur dioxide at its boiling point is comparatively small.

16052

Lucket, George Hazlewood

MOLECULAR ASSOCIATION OF AROMATIC HYDROCARBONS WITH THIONYL CHLORIDE, SULPHURYL CHLORIDE, AND SULPHUR DIOXIDE. J. Chem. Soc., 1932:1501-1512, 1932. 30 refs.

The viscosities, densities and heats of mixing for mixtures of thionyl and sulfuryl chlorides and sulfur dioxide with aromatic hydrocarbons were determined at 25 degrees. Comparative determinations were made with cyclohexane, stannic chloride, ether, and ethyl acetate. In contrast to cyclohexane, the aromatic hydrocarbons associated with thionyl and sulfuryl chlorides and sulfur dioxide and behaved like polar liquids which is in contrast to cyclohexane. The hydrocarbons may be electron donors, but it is probable that they can acquire an induced dipole moment from the inorganic molecule. This effect will only be apparent with molecules which are highly unsymmetrical or in which a large electronic shift is localized. Release of the electrons to the nucleus of the hydrocarbon by methylation increases the induction effect and the association. This view explains complex formation with other unionized inorganic molecules. Polarization of the hydrocarbons is a probable explanation of their activity in the Friedel-Crafts reaction, but in view of the complexity of the reaction, it cannot be determined whether the free halides or more complex molecules produce polarization.

16054

Beyer, W. F., F. Martin, and L. Rodnett

SYSTEMS OF SULFUR DIOXIDE AND THE ISOMERIC XYLENES. J. Am. Chem. Soc., vol. 59:362-363, 1937. 1 ref.

A series of freezing-point measurements were taken on systems of sulfur dioxide and ortho-xylene, sulfur dioxide and para-xylene, and sulfur dioxide and meta-xylene. The bulb method was used to determine the freezing points. The freezing-point curves of the three systems were constructed from the data. Each system has only one eutectic; apparently, there is no compound formation. The latent heats of fusion were calculated and compared with experimental values. Of the systems studied, only the o-xylene and sulfur dioxide solution behaved very nearly as ideal solution. The p-xylene system deviated positively and the m-xylene system deviated negatively from the ideal solution.

16082

Suter, C. M., P. B. Evans, and James M. Kiefer

DIOXANE SULFOTRIOXIDE, A NEW SULFATING AND SULFONATING AGENT. J. Am. Chem. Soc., vol. 60:538-540, March 1938. 12 refs.

The behavior of dioxane toward the addition of sulfur trioxide to form dioxane sulfotrioxide and disulfotrioxide was examined. Under anhydrous conditions both compounds are stable at room temperature, but on heating to 75 deg in carbon tetrachloride, decomposition ensues with formation of water soluble products. Both compounds react with water instantly to give sulfuric acid and regenerate dioxane. Either of the addition compounds serves as a reagent for sulfonation of benzene, m-xylene, anisole, naphthalene, phenol, and aniline. In the case of aniline, phenol and benzoic acid, the reaction occurs with the substituents rather than the benzene nucleus. Primary alcohols are converted into alkyl hydrogen sulfates. Since the higher members of this series are valuable detergents, this reaction has practical significance. Olefins are converted into compounds of the carbyl sulfate type without undesirable side reactions. A study of the structure of the addition product indicates that the carbon-sulfur bond is formed at the end carbon. Hydrolysis of the primary addition product yields hydroxysulfonates. The alkali hydroxysulfonates obtained from olefins containing ten or more carbon atoms have marked detergent properties. Further investigation of these compounds is in progress.

16083

Ryden, L. L. and C. S. Marvel

THE REACTION BETWEEN SULFUR DIOXIDE AND OLEFINS. III. HIGHER OLEFINS AND SOME LIMITATIONS OF THE REACTION. J. Am. Chem. Soc., vol. 57:2311-2314, Nov. 1935. 16 refs.

The formation of polysulfones from sulfur dioxide and a variety of unsaturated compounds was studied. Polysulfones were obtained by the combination of sulfur dioxide and methylpropene, 1-pentene,

2-pentene, 1-nonene, 3-cyclohexylpropene, and 1-methylcyclohexene. No reaction was obtained between sulfur dioxide and trimethylethylene, tetramethylethylene, pinene, or 1,4-dihydronaphthalene. The failure of these olefins to react with sulfur dioxide indicate that increasing the number of hydrocarbon substituents on the carbon atoms that are attached by a double union will tend to block the addition reaction. Sulfur dioxide was also treated with 1-chloropropene, trichloroethylene, allyl cyanide, 2-allyl-p-cresol, undecylenic acid, sodium undecylenate, ethyl undecylenate, ethyl erucate, crotonaldehyde, oleyl alcohol, and undecylenyl alcohol. Only undecylenyl alcohol gave a polysulfone. This confirms the observation that an alcoholic hydroxyl group in the olefin molecule does not interfere with the formation of a polysulfone. The failure of oleyl alcohol to combine with sulfur dioxide must be due to the fact that the double bond is in the middle of a long chain. The polysulfones described are probably of the alcohol type, as none of them were alkali soluble, and those which were treated with an acid chloride gave acyl derivatives. It was probable that the polysulfones derived from olefins of the type RCH double bond CH2 are closely related to propylenepolysulfone in structure.

16169

Bause, Georgen

FREEZING POINT OF GASEOUS MIXTURES AT VERY LOW TEMPERATURES. (Sur le point de congelation des melanges gazeux a de tres basses temperatures). Text in French. Compt. Rend. 148:1322-24, 1909. 6 refs.

The gas mixtures studied were $(CH_3)_2O$-HCl, $(CH_3)_2O$-SO_2 and $(CH_3)_2O$-CH_3Cl. The freezing point curve of the first and 2 series, one at -98 C, the other at -102, corresponding to a mixture of one ether and 4 HCl. Solid ether + SO_2 was obtained; temperatures were not given.

16207

Schiessann G., F. Patting, G. Preusser, and F. Steinbach

HETEROGENEOUS REACTIONS IN A FREE FALL REACTOR. (Heterogene Reaktionen in einem Riesselvolkenreaktor). Text in German. Inst. Chem. Engrs. Symp. Ser., no. 27:153-160, 1968. 12 refs.

The reaction mechanism in a free fall reactor was studied and compared with the ideal flow tube and the ideal agitator vessel. The hydrogenation of ethylene and the oxidation of carbon monoxide on grained Pd-containing catalysts were used as model reactions. The kinetic data of these reactions were determined in a fixed-bed reactor connected in parallel to the free fall reactor. The speed of the hydrogenation process was determined by the substance transport, that of oxidation by the chemical reaction speed. To interpret measurements of the amount of substance converted, mixing processes were studied using a dispersion model. The Bodenstein numbers obtained from the measured mixing coefficients were used to calculate the quantity converted. The measured values agreed well with the calculated values.

16219

Ruff, H. and A. W. Hofmann

DISSOCIATION OF GASEOUS COMPOUNDS BY ELECTRICALLY INDUCED GLOWING. (Zerlegung gasformiger Verbindungen durch electrisches Gluehen). Text in German. Ann. Chem. Pharm., 1\3(2):129-150, 1860. 4 refs.

Gases and vapors of liquids with low boiling points were exposed to powerful sparking as produced by the Ruhmkoff induction coil, to glowing platinum and iron wires, and to the high temperature of the flame arc, and the dissociation was observed. The induction coil is best suited for dissociation of ammonia; all the other methods take too long. Dissociation of C_2H_5OH begins immediately, but it is never complete. Dissociation of C_6H_6 and of C_6H_5Cl is slow and incomplete. Iron wires dissociated CS_2 completely but slowly; the flame arc is much faster. The induction coil is least suitable. Nitric oxide is dissociated rapidly by a glowing iron spiral and by the flame arc, and slowly by the induction coil. The dissociation is not complete. Similar results are obtained with SO_2. None of the methods work with dry CO. Reduction of CO_2 is slow with both the flame arc and the induction coil. The dissociation of CS_2, C_2H_4, C_6H_6, SO_2, NH_3, ClH and $SiFl_2$ was observed in like manner, and the efficiency of each method was stated.

16218

Ludwig, Barbara E. and G. B. McMillan

DISPROPORTIONATION AND COMBINATION REACTIONS OF ISOPROPOXY RADICALS WITH NITRIC OXIDE. J. Phys. Chem., 71(3):782-784, Feb. 1967. 5 refs.

Because the disproportionation:combination ratio of alkoxy radicals with nitric oxide is important in the photochemistry of alkyl nitrites, nitrates, and nitro compounds, isopropoxy-nitric oxide reactions were studied by pyrolyzing diisopropyl and nitric oxide mixtures at 25 to 180 deg. As determined by gas chromatography, the main reaction products were isopropyl nitrite, acetone, and isopropyl alcohol. Traces of acetaldehyde and methyl nitrate were also present. Over the ranges indicated, the following variables had no effect on the acetone: isopropyl nitrite ratio: diisopropyl peroxide pressure, 2.7-19.5 mm; nitric oxide pressure, 3.8-46.9 mm; nitric oxide pressure: peroxide pressure, 0.39-8.58 mm; percent peroxide decomposition, 1.0-12.1%; reaction time, 0.7-18480 min; and added nitrogen, 200 mm. Below 150 deg, product ratios were temperature dependent due to surface reactions. Above 150 deg, the isopropyl nitrite ratio is temperature independent. This constancy together with independence of the ratio of the other variables suggests that the disproportionation:combination ratio is 0.17 at 25 to 150 deg. Like alkyl-alkyl reactions, isopropoxy-nitric oxide reactions show appreciable difference in activation energies for disproportionation and combination processes.

16257

Mathieu, L. E. S., A. Crocker, and R. S. Wills

LASER OSCILLATIONS AT SUBMILLIMETRE WAVELENGTHS FROM PULSED GAS DISCHARGES IN COMPOUNDS OF HYDROGEN, CARBON AND NITROGEN.
Electron. Letters, 1(2):45-46, April 1965. 8 refs.

Oscillations at a number of wavelengths between 126 and 373 microns were obtained with a pulsed discharge through dimethylamine at low pressure. The stronger lines in this stimulated emission spectrum were obtained with many other volatile compounds containing hydrogen, carbon, and nitrogen, and with mixtures of hydrogen and bromine cyanide, and methane and ammonia. A new spectrum (four lines between 181 and 205 microns) was obtained with a mixture of deuterium and bromine cyanide. Oscillations at fourteen new wavelengths between 126 and 373 microns were obtained in these experiments. Seven of the wavelengths lie in the region of 200 microns, where no stimulated emission sources were previously available. The radiation was tentatively attributed to RnCN with n greater than one.

16348

Dikanova, A., M. M. Dubinin, and I. G. Radiets

INVESTIGATION OF THE DYNAMICS OF THE ADSORPTION OF BENZENE BY ACTIVATED CHARCOALS WITH VARIOUS POROUS STRUCTURES AND GRAIN SIZES. COMMUNICATION 3. ANALYSIS OF THE KINETIC FACTORS IN CONNECTION WITH THE POROUS STRUCTURE ACTIVATED CHARCOALS. Bull. Acad. Sci. USSR, Chem. Ser. (English translation from Russian of: Izv. Akad. Nauk SSSR, Ser. Khim.), no. 6:1130-1136, June 1969. 7 refs.

The change in the coefficient of internal diffusion of benzene in grains of activated charcoal was evaluated as a function of the filling of the volume of the adsorptive space in kinetic experiments conducted successively a four initial concentrations: C_0^I equals 1.1, C_0^{II} equals 3.84, C_0^{III} equals 11.7 and C_0^{IV} equals 23.4 mg/l. First the kinetic curve was determined at an initial concentration, C_0^I, and after the equilibrium state was reached, the experiment was continued with an abrupt change of the initial concentration to C_0^{II}. The time of change of the concentration was considered for the second experiment, etc., in calculating the effective diffusion coefficient. The curves show that the coefficients increased regularly with increasing volume and specific surface of the transport pores (transitional and macropores). An evaluation of the role of various kinetic factors in the general mass exchange is given. Under the conditions studied, longitudinal transport and internal diffusion of the substance being adsorbed are deciding factors for the dynamics of adsorption.

16439

Wilde, R. F. v.

RECENT INFORMATIONS. (Verschiedene Mitteilungen). Text in German. Chem. Ber., 19(1):353-357, Jan. - June 1870. 2 refs.

The production of acetylene by passing acetylene chloride through a red glowing porcelain tube can be increased by filling the tube with pieces of quicki e or soda lime. Experiments with acetylene showed that volumes of acetylene (C2H2) mixed with 4 volumes of hydrogen yields 2 volumes of C2H6. Ethylene (C2H4) mixed with the same volume of hydrogen yields C2H6. In further experiments, the influence of electric current on a mixture of SO2 and oxygen as well as on ethylene and on acetylene was studied. The volume of the SO2/O2 mixture was reduced slowly in the first case. It took 5 to 6 hours to reduce 50 cms of the gas. The two gases reacted directly with each other and SO3 was formed. Ethylene and acetylene condensated very rapidly under formation of polymers in the first case; in the latter case, an oily liquid condensated which solidified after several hours. This substance is brown and amorphous as well as insoluble. Further studies of this substance will be performed.

16461

Kashtanov, I. I. and V. P. Fyshov

INVESTIGATION OF THE OXIDATION KINETICS OF GASEOUS SULFUR DIOXIDE IN WATER SOLUTIONS AND THE PROCESSES OF CONTAMINATION OF MANGANESE SULFATE WITH PHENOL. (Issledovaniye kinetiki okisleniya gazoobraznogo sernistogo angidrida v vodnykh rastvorakh i protsessov otravleniya sernokislogo margantsa fenolom). Text in Russian. Nov. Teplotekhn. Inst., 1959:37-40. 7 refs.

Oxidation of SO2 in water solutions was studied experimentally to determine the effect of phenol both with and without MnSO4 catalyst. The following conclusions were reached. Oxidation processes taking place during absorption of SO2 by a solution are analogous to those for oxidation of solutions of sulfuric acid. The percent of oxidation decreases as the total quantity of gas passing through the adsorbing liquid is increased. The percent of desorption increases as the total gas flow rate through the absorber increases. The percent desorption increases as SO2 concentration of the solution increases. Manganese sulfate salts increase oxidation rate twofold. The presence of phenol in the solution retards autooxidation of , the percent oxidation decreasing with increased phenol concentration. Phenol in amounts of 0.1% completely eliminates catalytic action. Trace amounts of phenol sharply decrease the rate of autooxidation both with and without catalyst. Increasing the phenol concentration above 0.1% has practically no further effect. Oxidation of SO2 takes place not only in solution, but also at the surface of the solvent.

16605

Young, Russell A.

LIQUID METHANE...A CHEAPER MEANS OF PEAK SHAVING? Oil Gas J., 57(19):75-82, March 23, 1959.

Current programs and development in methane gas liquefaction and storage are reviewed. Either the expander cycle or the cascade type are preferred among the numerous liquefaction processes. The expander cycle is a simple straight methane-refrigeration cycle and is more economical in small plants. The cascade cycle is similar, but in large plants refrigerants such as propane or

ethane are substituted. The economics of peak load shaving are discussed. Tabular presentations of the comparative economics of peak load shaving include investment costs, fixed and direct costs, and operating cost per kw sendout.

16590

Mousseron, Max

ON DIVERS ALICYCLIC COMPOUNDS CONTAINING SULPHUR. (Sur divers composes alicycliques sulfures). Text in French. Compt. Rend., vol. 216:812-814, June 16, 1943. 7 refs.

In the course of a study of some S-bearing alicyclic compounds, several series of compounds were examined. A brief description of the method of their preparation, the temperatures of their melting and boiling points, their specific gravity at 25 C, and their index of refraction at 25 C are given. A list of these compounds is as follows: cyclohexylthiohydroxy-2 cyclopentane, cyclohexylthiohydroxy cyclohexane, cyclohexylthiohydroxy-2 cyclohexane, ethyl ether and methyl diether of bis-hydroxycyclohexyl sulfide, bis-hydroxy-2 cyclopentyl disulfide, bis-hydroxycyclohexyl, cyclohexylthioamino-2 cyclohexane, bis-amino-2 cyclohexyl disulfide, epithioethene cyclohexane, thiodicyclohexylmethylol-1, cis-methyl-3 cyclohexylsulfonic acid, trans-methyl-3 cyclohexylsulfonic acid, as well as the K-salts of the latter two.

16605

Reinger, Friedrich

THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON ALIPHATIC HYDROCARBONS IN ULTRAVIOLET LIGHT. IV PART: THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON N-DODECANE. (Zur Kenntnis der Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf aliphatische Kohlenwasserstoffe im ultravioletten Licht. IV. Mitt.: Die Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf n-Dodecan). Text in German. Chem. Ber., 77-79(3-4):191-194, 1944. 13 refs.

In a study of the reactions of high molecular straight-chained paraffines hydrocarbons to sulfochlorination, n-dodecane was subjected to a partial sulfochlorination to avoid excessive di and polysulfochloride formation. The sulfochlorides were liberated from the unconverted hydrocarbon through selective extraction with liquid SO2. Di and polysulfochlorides were precipitated from mixtures with monosulfochlorides with pentane. The mixture of monosulfochlorides was then desulfurized, leaving a mixture of dodecyl chlorides in which the chlorine assumed the same position as previously held by the sulfochloride group. The dodecyl chloride mixture was converted into dodecylenes with silver stearate. From 100 g of dodecylene mixture 87g water-insoluble fatty acids were obtained. The composition of the individual acids in mol percent was: C6 17.2, C7 18.6, C8 18.6, C9 19.2, C10 18.1 and C11 10.3.

16608

John, G. S., R. J. Den Herder, R. J. Nikovsky, and R. F. Waters

PHYSICOCHEMICAL STUDIES OF MOLYBDENA RE-FORMING CATALYSTS. In: Advances in Catalysis. Adalbert Farkas (ed.), vol. 9, New York, Academic Press, 1957, Chapt. 27, p. 252-267. 22 refs.

In reforming a virgin naptha over molybdena on alumina, best performance is attained with a cogelled catalyst containing about 10% molybdena. To understand the fundamental aspects of this performance, several physicochemical properties of cogelled catalysts were investigated. Hydrogen-deuterium studies, in addition to showing a minimum in exchange ability, reaffirmed that the effectiveness of the molybdena depends on the method of catalyst preparation. Estimates based on naptha conversion indicate that only 70-75% of the molybdena is dispersed on the external surface of the catalyst. A stable nonstoichiometric molybdous oxide is postulated as the catalytically active component. Abrupt, reproducible discontinuities in the kinetic constants of nitrous oxide from decomposition studies are interpreted as indicative of either electronic or structural changes in the active component of the catalyst. The stabilizing influence of alumina was evidence of a delicate balance of bonding forces and was seen in the conductive properties and heats of solution near 10 wt% MoO3. The studies also revealed that water has a stabilizing effect upon the nonstoichiometric oxide. Thermodynamic information shows that MoO3 is the stable phase in water vapor, while molybdenum is the stable phase in the presence of hydrogen. The variance of experimental observation from the thermodynamic calculations is attributed to an interaction between the alumina and molybdena and the stabilizing influence of water. In commercial reforming, the chemistry of the catalyst is further complicated by the presence of sulfur compounds. Sulfur dioxide absorption studies show that dispersing a monolayer of molybdena over the alumina surface will prevent adsorption of SO2. It is concluded that in the preparation and use of reforming catalysts, attention should be centered on the conditions which produce and stabilize the active intermediate oxide. Best performance is attained with a catalyst combining a high surface area with a high degree of dispersion and availability of the molybdena. These factors must be balanced against operational conditions that influence the degree of reduction of the molybdena and the accumulation of sulfur.

16611

Roumeron Ras and Robert Granger

RESEARCH ON THE ALICYCLIC SERIES. STUDY OF THE ORGANO-MAGNESIUM COMPOUNDS (6TH REPORT). (Recherches en serie alicyclique. Etude des organo-magnesiens (6e memoire)). Text in French. Bull. Soc. Chim. France, vol. 13:251-6, 1958. 27 refs.

In the course of carbonation of magnesium derivatives of the methyl-chlorocyclohexanes, a small yield was obtained in acid, particularly for compounds of two of the hydrocarbon chains with RgBr. These secondary reactions are essentially intermediate

reactions in a series of reactions; they are the consequence of the reducing property of the deoxidation of cylic magnesius derivatives. These reactions, which are quite comparable, are described in a study of the action of organo-magnesius compounds on acids and their salts, halogen derivatives of acids, esters, ketones, and aldehydes, that is, a series of compounds having a carbonyl group. The reduction of sulfinic acids formed in the course of fixation of sulfur dioxide on chlorocyclohexylmagnesius is also studied.

15626

Backer, H. J. and J. Strating

CYCLIC SULFONES DERIVED FROM BUTADIENES. (Sulfones cycliques, derivees de butadienes). Text in French. Rec. Trav. Chim., Vol. 53:525-543, 1934. 21 refs.

Addition of sulfur dioxide to butadienes gives rise to cyclic sulfones which possess a double bond which, in most cases, fixes Cl or Br atoms. On the other hand, sulfones whose double bond carries one or two groups of tert.butyl or two groups of phenyl resist the Br addition (steric hindrance). 2,3-dimethylbutadiene sulfone forms a dibromide, which yields a diol (trans) on hydrolysis. Direct oxidation of this sulfone by permanganate gives rise to the stereomer diol (cis). The dibromide, losing two molecules of hydrobromic acid leaves a weakly stable thiophenesulfone. An acetic solution of Cl reacting with dimethylbutadienesulfone fixes in it acetyl hypochlorite. The same type of addition-reaction could be carried out with the ethylene. The homologs of isoprenesulfone isomerize on exposure to ultraviolet radiation. The method of preparation and of some properties are presented, such as temperature of melting and/or boiling point, color, crystal habit, and, in the case of trans- and cis- isomers of 3,4-dihydroxy-3,4-dimethyl-thiacyclopentane-1,1-dioxide only, the crystal structure. The 37-odd organic compounds studied by the authors are identified by their chemical denignation and, in 25 cases, by their structual formulas as well and are ordered according to the 8 specific butadienes from which they were derived.

AUTHOR INDEX

Aarvik, J. *13391-M
Abbanat, R. A. *04927-F
Abe, S. *04212-A
Abel, B. M. *00176-F
Abel, N. *14811-M
Abeles, F. B. *01179-G
*07167-G *11100-G
Ablow, C. M. 09086-M
Accomazzo, M.A. 05250-E
06207-E *012241-M
Achenbach, K. 13913-E
Adams, G. F. 00379-B
*00942-D *01784-D
*06050-D
Adams, J. A. 01744-B
Adams, J. D. *04262-D
Agnew, W. G. *13958-E
Algine, E. P. *04248-D
*11498-D
Airey, E. M. *13882-M
Ajax, R. L. *00115-M
Akamatsu, T. *16494-B
Albert, D. K. 01503-D
Aldrich, E. W. 14882-M
Aldyreva, M. V. *04092-F
Alekseeva, M. V. *04084-D
*05959-D
Alekseeva, M.V. *05951-D
Alekseyeva, M. V. *10926-E
*06674-E
Alexeyev, A. Ye. *07316-F
Alfvisatos, B. P.*09117-J
Alkalis, A. A. 04723-F
Allen, E. R. *00139-C
*00608-M 01771-M
Allen, J. L. 01691-M
Alley, F. C. *01264-C
01304-D *01579-M
*07806-M
Allison, A. C. *01081-F
Allt, P. E. *10945-E
Alperstein, M. *04731-B
04773-D
Al'shits, I. M. *02595-D
Altman, P. L. *09764-M
Altshuler, B. *07027-F
Altshuller, A. P.
*03058-A *00109-B
*01815-B *00302-C
*00465-C *00757-C
00773-C 01828-C
*01984-C 02352-C
02359-C *03858-C
*05533-C *14019-C
*00106-D 00584-D
*00610-D 01832-D
*01979-D *02098-D
*02157-D *02158-D
*02159-D *02161-D
*02162-D *02349-D
*03059-D *03448-D
*03679-D *03680-D
*03684-D *03727-D
*07807-D *00622-F
01402-F 00961-G
*01983-H *01736-J
*01980-J *01981-J
*02179-J *00001-M
00034-M *01978-M
*00845-M
Amanat, M. 11682-F
08897-F
Amdur, M. O. *01584-F
*05650-F *06910-F
Andersen, N. C. *15271-D
Anderson, D. G. *05652-J
*08511-F
Anderson, R. B. 02737-E
Andreatch, A. J. *03569-D
Andreeshcheva, N. G.
*11476-D *02588-F
Adrienko, L. G. 02573-B
Anghileri, L. J. 09055-F
Antkina, T. A. 02595-D
Antontshin, N.W.
*14388-M
Arito, H. *10946-D
Arkhipova, O. G.
*04104-F *14596-F
Armstrong, A.A.; Jr.
*04454-M
Arnest, R. T. *00081-B
Arnold, W. N. *03573-G
05778-G
Arrington, C.A. *00161-M
Arutyunov, Yu. I. *10238-D
Asco, M. 08300-J
Asher, W. J. *09106-B
Astnger, F. *16605-M
Asset, G. *07705-M
Atkins, D. H. F.
*03783-G
Auge, R. G. 11543-M
Austeos, P. *00629-C
00190-M *01233-M
01824-M *01833-M
02243-M 0355--M
04456-M
Austin, L. G. *07979-B
Austin, R. R. *05583-D
*03575-M
Avy, A. P. *03129-B
Ayers, R. U. *12521-B

Basina, M. D. *02121-D
Babinsky, A. D. *04273-M
Bachman, H. E. 11234-E
Bach, F. C. *00096-F
03821-F
Bach, R. A. 05210-M
Backer, H. J. *16626-M
Baddour, R. F. 15125-M
15186-M *15196-M
Baes, A. P. 05039-J
Baglioni, G. *13499-M
Bailer, W. C. *09820-B
Bainbridge, A. E. *03673-C
Baker, C. J. 10668-D
Balchum, O. J. 02277-F
Balestrieri, S. 01289-D
*03291-D 04541-D
07706-D
Balts, J. A. 02460-D
Banner, A. P. *02725-E
Barber, E. D. *01501-D
*01720-D *00911-D
02210-J
Barboni, G. 09405-B
Barchas, M. 00092-D
Barger, R. J. 11171-B
Barlage, W. B., Jr.
*01304-D
Barnes, J. M. *07599-A
*03702-F
Barnes, R. *08295-F
Barodina, G. L. 08226-D
Barrer, R. M. *15131-M
Barringer, A. R. *04881-D
*05191-D
Barrington, A. E.
*02406-D
Barry, R. 02077-D

Barsina, G. 09936-J
Bartholomew, E. *01873-E
Bartle, R. 12887-D
Basbagill, W. J. *02317-J
Battigelli, M. C.
*06640-F *00650-B
Baum, E. J. *00916-M
*00917-M
Baum, F. *08373-B
*08257-D
Baume, G. *16169-M
Baxter, I. *01378-A
Bazas, B. N. 09117-J
Bazhenov, V. A.
15729-C
Beams, J. W. *15063-M
Bean, S. L. *15392-B
Beaver, H. *09752-B
Beckman, E. W.
*00164-B
Beebe, J. M. *06504-D
Begeman, C. R. 04936-J
01851-E *10734-B
Begemann, F. 07181-A
Begutter, R. 15248-J
Behmann, C. 09737-B
Beighton, J. *07925-B
Bell, F. A., Jr.
*03433-J
Bell, J. M. *16701-D
Beller, M. L. 00772-D
Beller, T. A. 02157-D
*01026-D *00036-D
*00542-D *00772-D
01736-J 01980-J
Belyakov, A. A. *05210-D
*06893-D
Bender, D. F. *07743-D
*00230-D 00765-D
*00768-D *00912-D
Benec, M. *14430-D
Penforado, D. M. 00257-E
*07836-E
Benfine, A. J. *00169-K
Bennett, P. A. *01894-B
*03680-B
Benson, C. S. *00834-C
Benson, D. 15490-F
Benson, H. E. *08390-B
Benson, S. W. *07467-M
07462-M *05423-M
*07791-M *09700-M
*01677-M 01680-M
01880-M 01881-M
*05062-M *07458-M
03066-M 00128-M
Bentina, G. I. *03938-D
Bergshoeff, G.
*02474-E
Berkowitz, N. 10292-M
Berner, A. *09738-D
Bernert, J. *13028-D
*16211-D
Bernhart, A. *16156-E
Berois, D. *02188-D
Bethge, P. O. *07214-B
Bettens, B. 11559-D
Beytia, E. *13078-M
Bhutler, A. S. *04621-B
Biersteker, K. *14479-A
Biller, W. F. 07627-D
Billings, C. E. *06182-M
Bilz, R. F. *06600-F
*04416-F
Bisel, G., Jr. 03433-J
Bishop, J. M. 08109-F
Bixler, H. J. 15143-M
15165-M 15265-M
Bjerklie, J. *14145-M
Bjerklie, J. W. *14202-E
Black, H. H. 03420-B
Blakeney, B. C. *03438-A
Blakeway, J. M. *16027-M
Bloomfield, J. J.
04052-A
Bobrov, R. A. *04999-G
Bocklan, A. H. *15308-C
Boddy, J. H. *02635-B
Boerma, M. 01850-E
Boettner, E. A. *08294-D
*01310-D
Bogacz, J. *03678-F
Bohlig, H. *10239-F
Bokov, A. N. 02549-B
Boldue, M. J. *03965-D
*03966-D
Bolotova, M. N.
*03926-J
Bolt, J. A. *01050-E
Bol' shakov, G. F.
*02074-H
Bonamassa, F. *03401-A
15308-C 00324-B
Bonnevie, P. 07599-A
Booker, D. V. *08042-F
Borg, S. A. 00842-F
Borisova, M. E. *08151-F
Borisyuk, Yu. P.
*06806-J
Borne, T. B. 14293-M
Borodulya, V. A.
14368-M
Borrell, P. *09080-M
Borsanyi, A. S. 06897-M
Bosco, G. *08315-J
*09936-J
Bottoms, R. R.
*15994-E
Boubel, R. W. *03107-M
*05806-D
Bovee, H. H. *12679-D
Bowden, D. H. 11309-F
Bowman, C. T. 13931-M
Bradley, C. E. 04992-M
Bradley, D. C. *04314-M
Bradley, D. W. 00214-D
03637-D
Bradow, R. L. 04731-B
04772-D
Braman, R. S. *03967-D
*15904-D
Brandt, C. S. *03472-G
00242-C
Braverman, M. M. 07564-D
Bravo, H. *05839-J
Brehop, W. M. 07846-E
Brennan, E. 14966-G
Brennen, W. 00161-M
Brever, W. *02066-B
Breuer, L. W. *09333-D
04529-E
Brewer, R. F. *05666-G
Breysse, P. A. 12579-D
Brice, R. M. *01830-J
*00268-B
Briceteux, J. *11554-D
Bridgeman, O. C.
*14882-M
Brief, R. S. 03971-D
Briegleb, W. *08.65-D
Brink, D. L. *08354-D
Brink, J. A., Jr. *00587-E
Brockhaus, A. 15899-D
08274-F
Brodine, V. 10310-B
Brody, O. V. *00910-F
Broering, L. C., Jr.
*05536-D *01831-D
Bronsberg, E. Sh.
*07153-D
Brown, G. M. 03981-E
Brown, M. F. 00038-D
Brubacher, M. L. *09331-B
*10135-B 00155-D
Brunner, M. *03122-B
*11457-B
Brunauer, S. *13543-D
Brunelle, M. F.
*01875-M
Brunel, D. 00779-F
Bryan, J. G. 02351-J
Bryan, R. J. 06099-F
Buchberg, H. *00177-C
Buchis, O. *00905-B
Buchwald, H. *01023-D
Buck, M. 07692-D
Bucove, B. 06535-J

Budinger, F. E. 04635-D
Budinskas, P. *04288-M
*04289-M
Budzak, P. M. *13050-D
Bufalini, J. J. *00034-M
*10489-D *01244-C
*02352-C 00757-C
*00773-C
Buff, H. *16218-M
Burakhovich, M. S.
*04256-G
Burgess, J. R. 00565-M
Burggrabe, W. F.
00587-F
Burkert, J. K. 06142-D
Burkatskaya, E. N.
*04107-F
Burleson, F. R. 00238-M
01206-D *01076-B
00184-G
Burlin, R. M. 04792-B
Burnett, R. B. 13453-M
Burton, G. G. 00499-F
Burton, M. J. 01453-B
Buscaglia, F. *06284-D
Bush, A. F. *00087-E
*03265-E
Bush, K. 00728-D
Buttivant, J. 09337-E
Buu-Hoi, N. P. *05284-F
Buzunova, L. V. *02549-B
Bykhovskaya, M. S.
*04255-D
Byrne, A. R. 13795-B
Byrne, J. 09421-B

Cadle, R. D. *04988-C
00139-C *03064-C
*01771-M *09078-M
Calman, C. D. 01361-E
Calongne, A. B.
*02500-D 03357-B
Calvert, J. G. 01648-M
11248-M 01961-M
Calvert, S. 05899-E
*03139-E
Calvert, W. R. *06285-E
*03145-E
Campau, R. M. 14036-E
Campbell, E. E. *01493-D
Campbell, J. M. *03685-J
*03686-F
Campbell, P. L.
*15996-B
Candell, A. *15763-D
*09605-B
Cann, G. R. *03584-B
Cantutti, V. *05981-D
Cantwell, E. M. *11548-E
Carducci, C. N. 10365-D
Caretto, L. S. *05147-E
*04617-M
Carnes, R. A. 05136-D
01922-D 03263-D
Carson, J. F. *13062-M
Carson, S. *03839-F
Carter, J. W. *16486-E
*15167-M
Carton, G. P.
C5981-D
Carugno, N. *03955-D
Carver, T. G. *06535-J
Cashmore, P. 09080-M
Cassell, E. J.
10967-F 01369-F
Cavanagh, L. A.
*13040-J
Cave, G. C. B.
*08356-D *04357-D
Cefis, F. 00754-F
Cejka, M. *14619-G
Chadwick, R. C. 03783-G
Chaigneau, M. *13805-D
Chaika, P. A. *15664-M
Chaikin, S. 16616-D
Chakraborty, B. B.
*10741-B *12086-D
Chamberlain, A. C.
00642-F
Chambers, J. C. 07448-J
Chambers, L. A.
10456-F *06534-F
Chandler, J. M.
*13562-B *05292-B
Chapman, R. L. *09111-D
05717-D *08681-D
*10960-D
Chapoux, F. *14842-L
Charlesworth, P. L.
15048-M
Charleson, R. J.
*04931-D
Chasen, B. L. 13278-M
Chase, R. L. 09785-B
*02911-B *04599-B
03010-D
Chatfield, R. E.
*09795-E
Chaudet, J. H. 09751-B
Chaudhuri, J. *09750-M
Chelikanov, E.N.
04083-F
Chen, E. 00119-M
Chernichenko, I. A.
02559-D
Chertova, N. D.
05238-F
Chiantella, A. J. 05042-D
*01461-D
Chien, J. C. W.
*01747-M
Chikira, M. *16187-E
Chipman, J. C. 07823-B
*11237-D
Chironis, N. P.
*05312-D
Chittawedgi, B. S.
*04610-E
Chizhikov, V. A.
*04087-F
Chovin, M. P. *00898-D
Chrisman, K. F.
*02354-D
Christian, J. G.
*03969-M
Christian, S. D.
*15816-M
Ciancolo, M. J.
05339-D
Ciborowski, J. *07495-M
Ciepliński, E. W.
*05837-D
Clark, M. F. *05836-D
Clark, R. E., Jr.
*02506-M
Clarke, J. M. *07159-F
Clarke, P. J. *16010-E
*05537-E
Clarkson, D. 03614-K
Clayton, G. D. *06078-G
Clayton, J. W., Jr.
*01426-F
Clayton, L. R. 01333-D
Cleary, G. J. *05678-J
*02023-B *08633-B
*05501-D
Cleeves, G. A.
*00188-D
Clemmesen, J. 03606-F
Climo, G. R. *06135-D
Clemons, L. A.
*02160-M 02159-D
*01832-D *00584-D
Cline, E. L. *10662-B
Cobbs, W. H., Jr.
15405-M
Coffman, D. H. *08953-B
Cohen, A. 09200-M
03234-D
Cohen, I. 01981-J
Cohen, I. R. 01978-M
05333-M 00001-M
*01693-D 03059-D
03679-D 03684-D
01984-C
Cohn, J. G. E. *13954-M

Cole, A. F. W. *00696-G
Colebatch, H. J. H.
*04829-F
Coleman, A. I. 01650-C
Coleman, H. J. 08118-M
13779-D
Coleman, T. 03485-D
Collier, S. S.
07512-M
Collinson, P. L.
*01550-E
Colucci, J. M. *04938-J
10734-B
Comery, D. 09099-M
Cominelli, A. *07690-B
Comming, B. T.
*04407-A *04651-J
03526-J *00985-B
01059-B
Condra, M. 00915-F
Confer, R. G. *03971-D
Conkle, J. P. *07977-B
*08025-B *08851-B
Contee, C. J. 00115-M
*01673-B
Conn, A. L. *10047-E
Conner, W. D. *00620-D
Connors, J. S. 15872-M
Conrad, W. 15996-B
Constan, G. L. *08833-E
Conte, J. F. 14033-B
Conter, G. L. 00473-F
Cook, E. B. 04653-M
Cook, W. A. 10772-D
Cookson, R. C. *03522-M
Coons, J. D. 00286-B
Cooper, D. E. *00583-E
Cooper, H. B. H.
1165-D
Cooper, J. C. *08345-E
Cope, W. C. (Chairman)
*03454-J
Copeland, J. O.
09053-K
Corn, M.
00727-J 00027-B
01238-D *00499-F
Cormelius, W.
09329-E
Corns, J. B. 10047-E
Coulson, D. M. 01592-D
Cowell, G. W. *10519-M
Crafts, A. S. 03616-G
Cressatie, D. A.
06910-F
Creswick, F. A. 14650-E
Crider, W. L. *11097-M
Crocker, A. 16257-M
Crocker, T. T.
*11299-F *00664-F
Cromwell, N. H.
*03480-F
Cronan, C. S.
*13653-M
Croom, B. H. *03446-M
Crosley, D. R.
*15045-M
Crouse, W. R.
*00337-B
Crowell, E. P. *13453-M
Crutckshank, F. R.
05429-M
Crumrine, D. 00353-M
Cuffe, S. T. *09838-B
*05067-B *01482-B
03113-B *03592-D
Cumming, R. L.
*03255-B 01802-D
Curley, A. 08329-F
Curnow, D. H.
10105-F
Curran, G. P. *15524-M
Cuthbert, J. *10241-F
Cvetananovic, R. J.
09079-M *02258-M

Dahle, E. W. Jr.
02825-J
Daigh, H. D. *04899-E
Daines, R. H. 16357-B
05420-B *14068-B
Dallas, J. L. 02317-J
Dallos, F. C. 01310-D
Danetskaya, O. L.
*02587-J
Daniels, E. K. *03864-E
Danielson, J. A. (Comp.
and ed.) 09704-B
Darley, E. F. *05342-B
*05344-B 05723-B
05724-B *03595-B
*03596-B 03612-B
03618-B *05342-B
*01076-B
Darley, E. R. *05680-F
Datta, P. 10945-E
Dauba, J. L. *14622-M
Dauer, S. *04357-E
Davignon, L. F.
*01080-F
Davies, R. A. *03986-M
Davis, H. J. *10964-D
Davis, H.P. *14045-B
Davis, K. *08598-F
Davis, R. B. 06025-D
Davis, T. C. 01382-D
01383-D 01384-B
Davydov, P. I. 02074-M
Dearden, P. *11143-B
Deckert, T. S. *05080-E
Deeter, W. F. 04899-E
*04922-B
DeGrazia, R. P. *11543-M
Deichmann, W. E. *00630-F
*03602-F
Delarue, M. C. *07161-F
Delaunois, C. *11568-D
*11569-D
Delle, T. J. 01628-M
01635-M
Delle Donne, C. L. 10039-M
Del Vecchio, V. *03202-B
*16352-B
DuMaeyer, E. *01668-F
DeMaeyer-Guignard, J.
01668-F
Demsie, L. *00727-J
*01238-D
de Mayo, P. *03009-M
Demidov, A. V.
*02439-D 07150-D
Den Herder, H. J. 16608-M
De Palma, T. V.
*14608-E *14609-E
De Pompeis, C.
14786-J
Derezinski, S. J.
04273-M
Derndinger, H. O.
*14773-E *08567-E
De Schmertzing, H.
*09734-D
Detrie, J. P.
*00453-C
Devitofrancesco, G. 09430-C
Devorkin, H. *03010-D
Dewhurst, J. R. *00275-D
De Witt, E. G. 15273-M
Deynega, V. G *13960-F
Dickinson, J. *09785-B
Dickinson, J. E.
01875-M 04616-J
01504-C
Diehl, E. E. *01362-B
Dikun, P. P. 02587-J
07292-J *07300-B
07299-B *06662-D
*14662-D *07298-D
Dilla, R. M. 04668-M
DiMattia, P. *02248-D
Dimitriades, B.
06698-M 10129-M
*10242-D 01269-D
*07838-D
Dimitriades, G.
*04857-D
Dimitroff, E. 04008-B

Dimov, N. P. *14648-M
D'Imperio, J. *09857-B
Dinneen, G. U. 08391-B
Diosszeghy, D. *14399-M
Dittmer, D. S. 09764-M
Dixon, J. P. *02237-A
Dmitriev, M. T. *11496-D
Dobrinskii, A. A. *02605-F
Dodd, H. C. 00747-D
Doepker, R. D. *00190-M *04456-M *09267-M
Domke, C. J. *05596-B *01560-D
Dontsmgili, V. *14711-F *14724-F *14124-B
Dorn, W. M. *08554-E
Dorsey, E. L. 06504-D
Dosmer, W. *16427-E
Doyle, G. J. 05849-M 06102-M 07100-M 15354-D *01463-F 01603-F *00004-F *01507-C 03883-B
Drake, L. R. 15648-M 15836-E
Dresler, M. *00092-D
Drowley, W. B. 00609-J
Dryden, I. G. C. *13494-A
Dubinin, M. M. 16348-M
Dubois, A. L. 07435-D
Dubois, E. *10668-D
Dubois, L. 07908-D *09432-D *06390-D *08809-D 00141-D *08643-D *08644-D *02702-J
Dubrovskaya, F. I. *11428-F *07548-F
Duff, G. F. 09369-D
Duffee, R. A. *04049-D
Dugger, W. T., Jr. *00950-B 03596-B
Dumarchey, G. 07408-J
Dumbeu, H. *15329-M *15439-M
Durant, D. *03066-M
Durau, F. *13713-M
Durham, W. F. 06496-F
Durrant, I. *14892-B
Duxbury, G. 06008-D
Dwyer, F. G. *14333-E
Dzedzichek, V. P. *07150-D
Dzhamaletdinova, M. K. *15305-M
Eaton, F. J. *08408-E
Eaton, H. G. 01430-D
Eberan-Eberhorst, R. *15321-E *15367-B *02130-D
Ebersole, G. D. *14264-E
Eccleston, B. H. 14127-B
Edfors, M. L. *01722-F 01805-F
Edmisten, H. G. 00847-J
Egger, E. W. *07462-M *01680-M *01880-M *01881-M *00128-M
Ehrenberg, L. 07214-B
Eichoff, H. J. 09223-D
Eisenthal, E. B. *15055-M
Ekberg, S. 06280-B
Elbert, E. 02227-D
Elbert, W. 02079-D 02083-D 02095-D 02797-D
Elbert, W. C. *01826-D *00399-D 02081-D 02225-J
Elkins, H. B. *06690-F
Ellerbe, E. B. 01634-M
Elliott, J. H. 05848-D *05648-B
Elliott, M. A. *05850-B
Ellis, C. F. *00464-B *06699-D
Elmenhorst, H. 14711-F 14724-F *14124-B
Elsevier, E. 02753-E
Elston, C. W. *07342-F
Emik, L. O. 00737-D *11307-F 00201-F
Emmett, P. H. 13543-D
Emrich, G. 11562-B
Endow, N. 01463-F 01591-F 00004-F *06102-M
Engdahl, R. B. 04631-D 14967-E
Engel, H. O. *01351-E
Engelmann, R. J. *00173-C
Engle, C. R. *09597-D 05316-D 04029-D *07878-D *11068-D
Engsfeld, R. 16211-D
Epstein, D. *03205-A
Epstein, G. *09023-B
Epstein, S. E. *00661-F
Epstein, S. S. *05384-J *02169-J *06363-F *01025-F *13006-F *00966-D *00728-D *01302-D
Erdman, T. 10969-D
Erley, D. S. 05561-D
Esposito, G. G. *05337-B *03991-D
Estes, F. L. *00650-F *04575-F *04650-F
Ettre, L. S. 05837-D *05863-D
Eubank, O. C. 10458-E
Evans, P. B. 16082-M
Everett, R. J. *04529-E
Ewald, H. *11562-B
Eye, R. 03761-B
Eyre, D. V. 15134-M
Eyring, H. 14258-M
Fabuss, B. M. *06997-M
Fagley, T. S. 00184-B 07[illegible]
Faith, W. L. *00233-A *00566-B *00344-C *13551-E 05573-J
Falk, H. L. 05109-B 01806-F *01968-F 00190-F *00750-F 01029-F 01030-F 04589-F 00243-F
Farmer, J. R. *03449-D
Farnsworth, H. E. *14227-M
Farrown, J. A. 06966-J 04770-J
Fasotte, W. 11554-D
Fattadi, A. J. *06720-M *06980-M *11147-M
Faust, W. J. 14604-E
Fawell, H. D. 00721-B
Fedoseeve, G. E. 07188-M
Feenan, J. J. *02737-E 03796-E 03797-E 07607-M
Feiner, B. 00683-F
Feinland, R. 03569-D
Feist, H. J. *07362-E
Feldstein, M. *05834-D *01289-D 03291-D *04541-D *07706-D 13860-F 03104-J
Felmeister, A. *11682 *08897-F

Felt, A. E. 14461-B
Fenimore, C. P.
*10746-B *02286-M
*04201-M
Fensterstock, J. C.
*10018-C
Ferht, E. *05226-M
Ferris, B. G., Jr.
*07162-F
Ferris, R. W.
04288-M 04289-M
Fetting, F. 16207-M
Feuerstein, D. L.
*08359-B
Fiala, F. *07223-B
*16296-B *07224-E
*08604-E
Fiero, G. W. *05166-B
*08376-B *10083-K
Filatova, A. S. *03940-D
Filov, V. A. *13657-F
Finfer, E. Z. *04856-E
Fink, C. K. *12084-B
Fink, F. *15657-H
First, M. W. *04419-B
Fischer, H. *13686-M
Fiserova-Bergerova, V.
*03962-F
Fleming, R. D. *01269-D
Flesch, J. P. *02323-D
*09886-D
Flieger, K. 00225-B
Flora, R. E. 11259-F
11260-F 11261-F
Flynn, N. E. 00337-B
Folkins, H. O. *12172-M
Foote, J. K. 00602-C
*01026-M
Formicheva, N. I.
*08171-D
Forney, R. R. *12668-D
Fosberry, D. A. C.
*02630-E
Foster, K. E. 02354-D
Fourel, R. 04177-F
Fox, A. L. *15990-M
Fox, F. T. 02226-D
Fracchia, R. F. *08270-D
Francis, A. W. *16411-I
Franco, P. *14785-J
Frank, N. R. 07162-F
Franke, W. 05440-M
Frankhauser, R. K.
10018-C
Fransky, O. *14004-E
Fraust, C. L. *01392-D
Freedman, R. W. *14838-D
*16620-D
Freeman, J. H., Jr.
*00936-E *03989-B
Frenkiel, F. N.
*05571-K
Friberg, L. 01722-F
Fried, J. *09024-F
Friedlander, S. K.
*15310-B
Friedman, N. 05208-M
Friedman, S. B.
07862-E
Friedrichs, K. H.
*15838-D
Friesell, J. W.
*12159-B
Frolova, I. N.
804258-F
Fryszinger, G. R.
*02442-E *14819-E
*08873-E
Fukuchi, T. *14944-E
Fujiwara, M. 16135-B
Gabinova, Zh. L.
*04091-J 03361-J
Gabliks, J. *06847-F
Gadomski, S. T. *04279-E
Gagliardi, J. C. *14462-B
*04460-B
Gahagen, H. E. III.
11100-B
Gamble, B. L. *11033-E
Gamer, C. H. *06894-E
Gammelgard, P. N.
*08071-A
Garber, M. J. 03630-B
Gardner, R. B. *00639-F
Gargala, R. V. 16444-E
Garibyan, T. A.
*13364-M
Garwig, R. P. 04470-E
Gasiorowski, K.
*05477-B
Gast, J. H. 05294-F
04575-F
Gavrilova, L. I.
*08446-D
Geckler, R. P. 08026-F
11539-F
Gelius, R. *05440-M
Geller, Z. I. 10238-D
George, J. C. *08557-B
George, R. E. *04792-B
Gerrard, J. E. 16020-E
05537-E
Gerstle, R. W. 05067-B
01402-B 01582-B
*03113-B
Ghannam, F. E. 14462-B
Ghosh, A. K. *05415-E
Giel, B. G. *02357-F
Gilbert, E. E. *14220-M
15805-M
Gilbert, N. 03544-D
Gil'denskiol'd, R. S.
11479-C
Gilyen, A. 16336-J
Gilfillard, E. R.
*15125-M
Gills, B. G. *02001-B
*04361-B
Gimadeev, M. M.
*04110-F
Giordan, W. P. 07006-F
Giry, L. 13805-D
Giuffrida, L. 07749-D
Glass, W. I. *07165-F
Glasson, W. A.
*02630-M *03114-M
14119-F
Glater, R. A. 0037-E
03265-B
Goetz, A. *06722-A
*06186-J *06632-C
*06235-C *05479-B
*01990-M *02412-M
*10041-M *06231-D
Gofmekler, V. A.
*04098-B
Goldberg, M. S.
08244-F
Gold'berg, M. S.
*06885-L *11489-F
Golden, D. M.
*01602-M *03067-M
03078-M 00120-M
Goldfinger, P.
*04228-M
Goldhamer, R. 03839-F
Goldsmith, J. R.
01905-L *00020-B
Goldstein, R. *05848-D
Goldwater, L. S.
*01038-B
Golothan, D. W.
*09325-E
Golubev, A. A. *12969-F
Goodacre, C. L. *02637-E
Goppers, V. *01991-D
Gordon, R. J. *14180-J
*01027-C
Gorelova, O. N.
*07299-B
Gorin, E. 15524-M
Gorskaya, R. V. *06902-D
Goshgarian, B. B.
07451-B
Gottauf, M. *14500-M
Gourinoff, B. P. *00835-B

Greže, K. *07366-J
Graham, J. I. *13766-M
Grahek, F. E. 09078-M
Graiff, L. B. *02358-D
Granger, R. 16611-M
Grant, E. P. *02056-K
*05320-E 09331-B
Grant, R. J. *06056-M
03429-D
Grasso, C. 13780-J
Gray, J. T., Jr. *04008-B
Greaves, D. A. *12086-B
Green, A. E. S. *07981-D
Green, L. E. *01503-D
Greenburg, L. A. 09074-F
Gregory, A. R. *00316-G
Greiner, D. 07998-M
Grella, A. 08315-J
09389-B 09388-D
Griffin, G. W. 00356-M
02446-M
Griffing, M. E. *15033-E
Griffith, B. W. *05639-F
Grigorenko, A. I. 04754-D
Grigor'ev, Z. E. 08221-F
Grigor'eva, K. V.
*02566-F *08221-F
Grtswold, H. E. 00583-E
Grtswold, S. S. *09324-K
*08075-E *00107-B
Grob, K. *01278-D
Groezinger, H. *15257-E
Gronsberg, E. Sh.
*07146-D *02135-D
Gross, E. *16124-E
Gross, G. P. 14424-E
Grovenstein, E., Jr.
*01194-C
Gruber, C. M. 05330-J
Grumer, J. *07001-E
Grundnes, J. 15816-M
Grupinski, L. *12072-D
Grushko, V. M. *07292-J
Guillemet, F. B.
05656-G
Gurinov, B. P. *05231-F
*07291-F *06200-B
Guse, W. 11061-D
Gusev, I. S.
*12276-F *06905-F
*07475-F
Gusev, M. I. *12284-F
*04083-F *11479-C
Gussey, P. 04771-E
Gustafson, P. *00103-E
Guyer, H. 04328-D
Haagen-Smit, A. J.
00229-G 01645-E
*04992-M
Haas, G. C. 07625-B
Haddad, R. *04052-A
Hadzija, O. 14428-D
Haenszel, W. *03486-F
Haentzsch, S. 15154-J
Hagen, D. F. *07635-B
Halitsky, J. 07561-B
Hale, C. A. *14451-B
Hall, E. L. 04990-B
Hall, M. C. 04535-E
Halpin, W. R. 11164-B
Hamblin, R. J. J.
*14604-E
Hamill, P. V. V.
*01092-F
Hamilton, W. F. 05613-M
*05149-E
Hamming, W. J. *05110-J
*03270-F *01504-E
*00502-C *08558-
Hammond, E. C. 01813-F
Hammond, G. S. 15046-M
Hangebrauch, R. P.
*01404-B *05005-B
05133-B *01788-B
02232-B 00621-B
Hanks, J. J. *01546-B
Hansen, A. C., Jr.
*14164-M
Hanst, P. L. *11030-D
Hantzsch, S. *08322-J
*03369-D
Hara, I. *04148-F
Hareshima, S. *07368-F
Hardison, L. C.
*14326-E
Hardman, J. A. 16526-B
Harington, J. S.
*01467-M *07783-F
Harilaos, N. J.
*14505-E
Harkins, J. 05611-M
*12002-D *03103-D
03978-F
Harkness, A. C.
*06710-E *00952-C
Harper, D. T. *08026-F
Harris, M. E. 07801-E
Harrison, A. P., Jr.
*07463-M
Hartley, F. L. *05832-E
Hartmann, H. F.
*03983-E
Harvey, P. D. 14505-E
Hasebe, S. *13415-M
Hashimoto, M. *16135-B
Hass, G. C. 03586-L
*03266-E *00324-B
Hatano, S. 15909-D
Hathaway, C. E.
08838-D
Haugen, G. R. 05423-M
01677-M 03062-M
07458-M
Hauser, T. R. 02802-M
*04930-G *01802-D
02084-D 02086-D
02088-D 02090-D
02803-D 02805-D
03081-D *00214-D
02097-D *03537-D
02945-J
Hayata, Y. *15345-F
Hayer, M. *01658-B
Hayes, W. J. *01051-F
Haynes, W. P. 15078-M
Hays, R. B. *07972-F
Hearst, P. J. *05233-M
Heath, C. C. *09148-B
Heath, C. E. 03887-B
Heck, W. W. *11072-G
*05610-G *06546-G
*00242-C
Hedlund, F. *06280-B
Heggested, H. E.
*12042-G *00184-G
*12042-G
Heicklen, J. 02534-M
02535-M 02517-M
*03488-M *04583-M
Heidt, L. E. 03673-C
Heimann, H. *00174-F
*00281-F *00308-F
Hein, G. H. *14967-E
Heller, A. N. *11182-B
Hellwig, K. C.
*09196-E
Henderson, J. J.
00220-B
Hendrickson, E. R.
*03504-J
Hendrix, W. P.
00069-M
Heno, W. 13876-M
Herkstroeter, W. G.
*15046-M
Hermann, E. R.
01392-D
Herold, P. *15995-E
Herrold, R. McD.
*05372-F
Hersch, P. A. *10672-D
Hertvik, F. *04179-E
Hess, K. *06127-E

Hess, L. D. *08827-M
02493-M *07798-M
00709-C
Hesslink, P. J.
*15977-D
Hetmanets, I. Ya.
04109-F
Hetsche, H. O. *02685-D
07373-D *09393-B
Heuser, A. R. *16498-B
Heuss, J. M. *14119-F
Hiam, L. *16616-D
Hickey, R. J. *08331-F
Hicks, J. R. *06482-C
High, M. D. 13438-A
Hildebrand, F. W.
*01949-J
Hill, D. M. 04028-B
Hill, D. W. *16277-D
Hill, R. L. *09365-D
Hillman, D. E. 02875-D
Hilst, G. R. *02361-J
*14997-J *11225-C
Hind, C. H. *14297-E
Hindawi, I. J. *00961-G
Hinners, R. G. *00142-D
*01987-F
Hiramatsu, T. 16132-D
Hirao, O. *06144-E
Hirschler, D. A., Jr.
13144-E
Hitch, B. F. *15526-E
Hitchcock, L. B.
*05573-J *03871-B
Hoare, E. E. *08353-M
Hochheiser, S. *02822-J
Hockensmith, D. A.
*06947-F
Hocker, A. J. 11237-D
*04316-D
Hocker, J. D. *06328-D
Hodgson, F. N. 04234-B
08033-B
Hofer, L. J. E.
*04771-E *00015-E
Hofmann, W. 16216-M
Hoffmann, D. 01286-F
*04539-F 04553-F
04590-F *01803-B
*06108-B *15708-D
Hoffman, H. *08496-E
11457-B *08497-B
*08802-B
Hofreuter, D. *01988-F
Hogger, D. *08801-F
Holbrook, C. G.
00275-D
Holiday, G. W. 07635-B
Holland, G. J.
*15490-F
Holland, H. R. *01165-B
Holleax, E. *14450-M
Hollis, O. L. *15802-D
Holma, B. *00484-D
*12580-F
Holmes, R. J. 02911-B
Horma, M. *06329-F
Hood, D. B. 01426-F
Hood, L. V. S. *11567-D
Hooker, G. W.
*15048-M *15878-F
*15836-E
Hoover, G. M. *08838-D
Horiguchi, S.
*07375-D *03902-F
Horn, E. *00411-L
*07230-B
Hornedo, M. D. *03505-J
Horsley, R. R. 06096-B
Horton, A. W. 01395-D
Horton, J. F. 01495-D
Horvath, H. *09116-M
04931-D
Hottel, H. C. *02253-M
Hovey, H. H., Jr.
*04833-J *00671-B
Howe, E. L. 02001-B
04361-B
Howes, J. E. 06682-D
Hrutfiord, B. F.
*05409-E 01885-B
Hudson, G. *16266-J
Hueber, V. R. *01430-D
Huentgen, E. *14475-L
*10553-L
Hueper, W. C. *08241-F
05298-F *02288-F
Huster, F. G. 07942-F
03823-F 02332-F
*00473-F
Hughes, A. N. *07498-M
Hughes, E. J. 07628-D
Hull, D. M. *04998-B
Huls, T. A. *00592-B
Hulsman, H. 15088-M
Huntgen, E. *08803-L
*00582-E *02048-D
Hurn, R. W. *00241-J
*14116-B *01381-B
*01382-B *01383-B
*01384-B *06698-M
*10129-M *07628-D
Hus, M. 13594-E
Hutchins, T. G. 07705-M
Hutchison, D. H. 04994-B
Huybrechts, G. 04228-M

Ide, H. M. 01499-D
Iizuka, Y. *07352-F
Ilgenfritz, E. M.
*00730-J 06430-J
02725-E
Il'ntskii, A. P.
*02596-F *10637-E
Imasheva, N. B.
*04070-F
Inamura, S. *14494-F
Innes, W. B. *14525-D
Inscoe, M. N. *06955-D
Ingels, R. M. 09795-E
00345-C
Ingtulla, M. *13788-J
Ingram, W. *00682-J
Innes, W. R. *13036-E
Ireland, S. 16701-D
Iritani, T. *04143-D
Irons, G. O., Jr.
04500-F
Isaev, N. S. *07289-L
Ishikawa, S. *11309-F
Ishinishi, N. 16542-F
Itskovich, A. A.
*08750-F
Ivanova, G. Ya. 14773-D
Ives, N. F. *07749-D
Ixfeld, H. *07692-D
*14476-D
Izmerov, N. F. *08153-F

Jackson, M. W. *15513-E
*03456-F *05323-B
01894-B *03680-B
*02848-D
Jackson, W. E. *00679-B
Jacobs, E. S. *01225-D
*12001-D
Jacobs, J. 11263-D
Jacobs, M. B. *07564-D
*01941-B
Jacobsen, J. L. 07798-M
Jacumin, W. J.
*00992-F *02747-D
Jaeger, J. *10755-D
*14658-D
Jaffe, L. S. *12175-F
*04320-M *04321-F
Jagatic, J. 06710-F
Jagur-Grodzinski, J.
09750-M
James, G. E. 10044-B
James, M. R. 05047-M
Jansen, G. A. *00379-B
Jaros, G. D. *00469-D
Jaskulla, N. 02048-D
Jeffery, P. G. *05263-D
Jeltes, R. *03949-D

Jenkins, G. I. *10428-G
Jennelle, L. F. 11632-F
Jensen, D. A. *01621-E
*01624-E *00504-G
Jewell, R. G. 04922-G
Joachim, E. U.
05380-E
Jodeck, P. *15966-E
Johansen, L. N. 06365-E
John, B. 09197-M
John, G. S. *16608-M
Johns, R. H. *04470-E
Johnson, A. J.
*15861-E
Johnson, F. A.
*08077-D
Johnson, H. 01034-M
*01606-D 02843-D
01973-D 00440-D
00767-D 00926-D
00111-J 12045-G
Johnson, H. C.
*00208-B
Johnson, H. W. 05100-M
Johnson, J. E. 03969-M
*05042-D *15529-D
05209-E
Johnson, K. J. *05720-F
Johnson, W. R. 13666-B
Johnston, A. E. *07061-D
Johnston, H. S. *02534-M
*02536-M 03486-M
04583-M 04988-C
Jonathan, N. *14917-M
Jones, C. 01550-E
Jones, E. P. 14220-M
Jones, G. W. 02286-M
04201-M 10748-B
Jones, J. L. *06052-D
*01891-F
Jones, M. H. 00177-C
Jones, R. C. 08295-F
Jones, W. M. *04671-E
*04674-E
Josephson, A. S.
*02173-F *00210-F
Just, J. *10320-K
Juvet, R. S., Jr.
*08105-M

Kachmar, E. G.
*06661-D *03929-D
Kagawa, J. *08305-F
Kahl, H. 14470-D
Kallos, N. C. *03158-B
Kaiser, E. R. *07882-E
*07561-B
Kajland, A. *01805-F
Kalasky, J. D. *01544-B
Kalika, P. W. *09310-A
Kallal, T. 01990-M
Kamal, M. M. *08078-M
Kamishima, H. 16494-B
Kammermeyer, K.
*15187-M 15012-M
Kane, J. M. *08837-E
Kanter, C. V. *02610-B
Karz, E. *01365-E
Kaphaer, E. A. *08524-B
Kaphaev, E. A. *04111-F
Kashtanov, L. I.
*16463-M
Kato, T. *01761-C
Katsenelenbaum 11426-F
Katz, M. *01640-A
*03556-A *01270-J
00696-G *05299-D
*05502-D *08762-D
Kaufman, A. 06479-E
Kawanami, Y. *07196-J
Kawasaki, E. H. 06329-F
Kayne, N. 05648-B
03762-E
Kazanina, N. I. *11485-D
*11493-B
Keagy, D. M. *03458-J
03504-J
Kearney, P. C. 07964-F
Keenan, R. G. *08079-D
Kelenffy, S. *16440-J
Keller, J. L. *09421-B
Kemmitt, D. A. 01502-B
Kenaay, J. A. *04139-E
Kendall, D. A. 14109-D
Kendall, E. F. 06699-D
Kendrick, J. B., Jr.
*05723-G *05724-G
03606-G 03609-G
03610-G
Kenline, P. A. *03506-J
*00638-F 01673-B
Keplinger, M. L.
03602-F
Kesseler, G. 08592-D
Kessler, M. L. *16361-D
Khan, A. U. *07257-C
Khanin, I. M. *04581-E
Khesina, A. Va. 10637-E
Khesina, A. V. 03935-B
Khikmatullaeva, Sh. S.
*08443-F
Khrusteleva, V. A.
06674-E *05376-D
*07285-D
Khukrin, E. V.
*06677-L
Kimina, S. N. 10631-B
King, I. R. *05043-M
King, P. J. 15851-M
King, W. H., Jr. *15200-D
Kinnetan, J. R. 00157-L
Kinsey, R. H. *09840-B
*09839-B
Kipping, F. J. 05263-D
Kireeva, I. S. 02600-E
*07570-B 04106-B
Kiseley, A. V. *14391-M
04484-D
Kitani, S. 02935-M
Kitrosskii, N. A.
11496-D
Klein, R. 07509-M
*01683-D
Kleinfeld, M. *00883-F
Klejnot, O. J. 10041-M
Klimisch, R. L.
*14335-M
Klinkstek, K. E.
*14697-B
Klosterman, D. 00622-F
Klosterman, D. L.
*00122-D
Klosterman, L. L.
01402-F
Knapp, H. *05360-E
Knuth, R. H. 02205-D
Kobayashi, M. *03215-H
Kochetkova, T. A.
04104-F
Kohler, M. *09223-D
Kokurin, A. D. *15914-M
.ol'kovski, P.
*08490-D *10089-D
Kononova, V. A.
*03931-J *08196-J
Konopinski, V. J.
02239-J *01089-J
03255-B
Konosu, H. *02886-D
*07386-D *00449-D
*04199-D
Konstantinova, A. I.
*05238-F
Kopa, R. D. *00057-E
Kopanev, A. I.
*06907-F
Kopczynski, S. L.
03858-C 06533-C
*01825-C *02359-C
08656-M
Koppe, R. E. 01784-D
Koprowska, I. 03670-F
Korsh, M. W. *03547-A
*02842-F 02376-B
*00068-D
Kerving, J. *15088-M

Kosteva, T. A. *07308-F
Kotake, S. *00601-G
Kotin, P. *01469-F
*01806-F *01844-F
*11275-F 01966-F
*00195-F 00750-F
*01015-F *01029-F
*01030-F *04589-F
*06243-F 05109-G
Koukol, J. 00950-G
Koutsoukos, E. P. *00101-H
Kozima, T. 04742-D
Kozyrev, B. P. *15729-C
Kraeft, D. 13989-D
Kralik, O. 04179-E
Krasovitskaya, M. L. *11484-F *06859-F
Kratchelt, T. E. *02825-J
Kreyberg, L. 03685-J
Krilov, N. A. *05383-D
Kristinsson, H. *00356-H
Krivoruchko, F. D. *04246-C
Krupp, C. P. *03872-E
Krutkov, P. A. *04086-D
Krueger, A. P. 00661-G
Kruse, R. E. *04026-G
Krylova, N. A. *07578-D 04064-D *04245-C
Krynitsky, J. A. *14728-E
Kube, H. D. 01546-G
Kudryashov, V. V. 06305-E
Kuhn, H. *02648-E
Kuklin, I. *08003-E *07971-E
Kukhovkaya, A. I. 04114-B
Kulinskaya, I. L. *08442-F
Kunte, H. *08589-D
Kupel, R. E. 01049-F
Kuratsune, M. 02853-H
Kurlyand, J. A. *16016-B
Kuster, E. C. *09099-H
Kutscher, W. *11572-J *09713-F *02609-F *01714-D *11571-H
Kus'minykh, A. I. 03940-D
Kylin, B. *05729-F
Laffay, M. T. *10660-B
Lage, I. J. 02108-D 04796-D
Lagoshnaya, R. M. *06875-D
Lahmen, T. 08322-J *140776-J *15154-J *11574-D
Lair, J. C. 07613-E
Lamb, F. W. 13033-E
Lampe, K. F. *03490-F
Landee, F. A. 15875-E
Landes, J. H. 09986-F
Landsberg, H. E. *00259-F
Lang, H. W. 14039-D *15484-D 16620-D
Lang, L. *16164-E
Langmann, R. *07235-K
La Pera, M. E. *03164-B
Larkin, R. L. *01049-F
Larsen, R. I. *06186-K *02239-J *00110-J *00351-J 00739-J *05912-B *00796-B *00962-B *03620-D
Larsen, E. C. *07187-B
Larson, G. P. *05575-C *07823-B
Lassiter, J. L. *10028-H *10119-H *10118-G 10118-F
Lasseter, S. W., Jr. *15405-H
Lauch, R. P. 01414-B
Latchum, J. W., Jr. *15872-H
Lavrov, N. V. *14379-H
Lawrason, G. C. 12161-B
Lawrence, S. *09337-E
Lawrence, R. III. *02753-E
Laws, E. R., Jr. *08329-F
Lawson, S. D. *11204-I
Lawson, S. D., Sr. *13795-B
Lawther, P. J. 06003-F 09415-F *00310-F *01059-B
Leach, P. W. 02160-H
Leach, P. W. 01815-B *01958-B
Leach, S. J. *03645-E
Lebbe, R. J. 00898-D
Lebowitz, M. 09440-F
Lederer, E. L. *14313-H
Lefauc, R. F. *09793-E
Lee, R. C. *14975-E
Legatski, T. W. 05632-B
Leggewie, G. *16074-B
Lehmann, E. *15575-J
Leighton, P. A. *00969-B *04635-H
Lemaigre, F. 03122-B *05791-B
Lemmens, T. J. 00188-D
Lemke, E. E. *03462-J *04962-E *06031-B
Leng, J. E. 03076-F
Leng, L. J. 01958-B 02098-D
Leon, I. A. 05420-G
Leonarzos, G. *14109-D
Leptich, P. 01867-E
Lester, D. *09074-F
Lestz, S. S. 15863-B
Leuckel, W. 16363-D
Levin, V. *06066-D
Levine, M. 05149-F *05613-M
Levine, S. G. 01196-M
Levy, E. J. *05404-D
Lew, M. *07884-E
Lewis, J. L. 14830-G
Lewis, J. S. 05578-D
Lewis, R. J. *07885-D
Lewis, R. W. 03575-M
Lewis, T. R. *07842-F *02332-F
Leyhe, E. W. 03446-M
Liao, S. Q. 00629-G 01833-M 09267-M
Liberti, A. *09430-C
Lichtenstein, E. P. *16356-F
Lichtenstein, S. *08645-M
Lieberman, L. M. 06702-D
Liebhafsky, H. A. *06950-B
Liedmeier, G. P. *14796-B
Lijinsky, W. *06004-F
Likins, R. T. *08226-D
Linch, A. L. *06625-D 02854-D
Lindberg, W. *13952-B 13953-F
Linderberg, J. 04409-M
Lindley, D. J. 05596-B 01560-D
Lindvall, R. V. *04102-D
Linnell, R. H. *02786-D *02785-D
Linnenbom, V. J. 14158-M
Linsky, B. 11062-G
Linville, W. *05155-E

Liston, L. *07698-I
Litvinov, N. N. *08244-F
Liu, B. Y. H. 06203-D
07271-M *07272-M
07273-M
Livingston, R. 00426-D
Lickal, G. H. *16052-M
Lodge, J. P., Jr.
02237-A *03674-A
01720-D *02210-J
Lodwick, J. B. *05300-E
Lehner, K. *08488-E
00269-E
Lombos, B. A. *09030-M
London, A. L. *05633-B
Long, R. 11143-B
10741-B 01008-B
12086-D *05325-M
*05345-M
Lopukhova, G. S. 11498-D
Loquercio, P. *08406-B
Los', L. I. *07304-J
Loudon, D. E. *03075-C
Louis, R. *08316-D
Low, C. W. *02415-D
*01356-D
Low, M. J. D. *03485-D
Lowd, J. D. 16417-I
Lubowe, I. I.
*01077-F
Luchter, S. 14145-M
Ludwicka, A. *15749-D
Ludwig, B. E. *16236-M
Ludwig, C. B. *12007-D
Ludwig, F. L. *01597-D
Ludwig, J. H. *16263-B
01830-J *09060-F
*04808-B *05007-B
*01488-B *02362-B
*00186-B
Luft, K. F. *08592-D
Lugrova, O. 14658-D
Lufs, P. *15385-D
Luk'yanchikov, V. S.
14385-M
Lunche, R. G. *08556-K
03270-F 05859-E
04962-E *14341-E
02610-B
Lundeen, S. *00426-D
Lundstrom, E. A.
08078-M
Lur'e, V.L. *00895-B
Luther, V. H. *00269-E
Luts, J. R. 03864-E
Lynn, D. A. *01912-J
*00783-C
Lyshkow, N. A. *03096-D
Lyublina, E. I. *13933-M

McCabe, J. R. *07887-D
McCaldin, R. O. *03527-D
McCarroll, J. R. 00602-J
*01369-F *09440-F
McCarthy, J. L. 05409-E
McCormick, B. A. 04933-C
McCormick, R. N. 00925-M
McDonald, J. E. *09224-B
McEwen, D. J. *03977-D
*07104-D *00887-F
McKean, W. T., Jr.
*01805-B
McKee, H. C. *15161-B
McKee, J. E. *00369-K
McKinnis, A. C. *15874-M
McLaughlin, H. E.
13466-M
McLaughlin, M. 05418-F
McLean, D. R. 04667-D
McLouth, B. F. *14609-E
McMichael, W. F.
*01837-B *00271-B
McMillan, G. R. *01961-M
03066-M 16236-M
McMullen, T. B. 01912-J
McNerney, J. M. 00887-F
01348-F *03820-F
McPherson, S. P. 00931-D
McPherson, S. P. 00931-D
*01471-J
McTaggart, N. G. *12663-D
Maahs, H. G. *08365-E
Mabson, W. E. 07977-B
08861-B
MacBeth, W. G. 00502-C
Macdonald, W. E. 00630-F
MacEwen, J. D. *08026-F
*11539-F 01346-F
MacFarlane, M. *15744-M
Mackenzie, V. G. *01073-A
*00225-B *07601-L
MacPhee, R. D. 05110-J
Mader, P. P. *03761-B
Maddox, F. D. 03027-J
Maga, J. A. *01211-A
*07844-B *08300-J
*03586-L *00157-L
Magill, P. L. *04994-B
*04973-D
Maher, G. H. *07483-K
Maier, W. B. 16252-F
Mainster, M. A. *10520-M
Major, W. D. *09655-B
Makedonskaya, R. N.
04255-D
Malanchuk, M. *04825-D
Malechova, M. 14430-D
Mallein, R. G. *04177-F
Mallen, M. H. 01026-M

Mallucci, E. 01081-F
Malyarova, L. K. 11484-F
06869-F
Mamedov, A. M. 03934-F
Mandl, M. 01558-B
Manes, M. 08056-M
Mani, J. C. 08827-M
Manlis, M. D. 04098-B
*07575-D
Manning, R. N. 10660-B
Mannella, R. J. 05640-F
Mantashyan, A. A. 13364-M
Marcali, K. *02864-D
Marchenko, E. N. *08486-B
Marcus, W. L. 07332-F
Markus, G. A. 14767-B
Marsh, C. M. 04314-M
Marsh, D. *02517-M
Marsh, K. J. *16018-D
Marshall, D. W. *06512-E
Marshall, P. 16027-M
Martin, A. E. 00310-F
Martin, G. B. 01264-C
11231-B
Martin, K. 16054-M
Martinelli, G. *09234-D
Marton, J. *13505-M
Martynfak, Z. 07403-D
Marvel, C. S. 15970-M
16063-M
Mascioli, V. R. *16023-M
Masdin, E. G. 01744-B
Masek, V. *08486-J
*16125-B
Mashbits, F. D. 07291-F
Mashiko, Y. 02886-D
00449-D
Masse, V. F. *14424-E
Mastrangelo, J. J.
*07086-F
Mastromatteo, E. *05747-F
Masuda, Y. *02853-M
15706-D
Mathews, D. S. *01404-J
Mathews, R. G. 07395-M
Mathias, L. E. S. *16257-M
Matijevic, E. *02935-M
Matila, M. M. *13217-E
Matsak, V. G. *06648-M
*03625-M *08162-E
Matshinar, H. 05456-D
Matsumura, Y. *04206-D
*04648-D
Matsushita, H. 05461-D
*14125-D 00451-D
Matufuji, H. *03898-F
May, R. *10539-E
May, J. *03773-D
Mayer, M. *00972-B

Maynard, J. B. 09574-D
Mayo, R. R. 05058-M
Mayrsohn, H. 14180-J
Mead, J. 12935-F
Meadows, F. L. 00534-J
Meaney, J. *08002-E
Meeker, J. E. 01817-D
06200-D 00870-F
00625-J 03426-J
Mehta, D. S. *05899-E
Meijer, R. J. *15243-M
Meinwald, J. 07510-M
Meites, L. *14757-E
Melchiorri, C. 08296-D
Melchiorri, P. 02248-D
Mellen, A. W. *15005-M
Mel'nikova, L. V. 15730-D
Mel'nikova, P. A. 08171-D
Memory, J. D. 10520-M
Mencher, S. K. *06170-E
Mende, T. J. 03490-F
Mequerian, G. H. 09745-M
Mercer, W. B. *08083-D
Merriman, G. M. *05421-G
Messen-Jaschin, G. *13704-E
Meyer, J. A. 15032-M
Meyer, R. T. *10034-D
Meyers, R. A. 14830-E
Michael, A. *15704-M
Michaels, A. *08084-E
Michaels, A. S. *15104-M
*15143-M *15165-M
*15183-M *15186-M
15198-M *15265-M
Mich, S. R. 01132-B
Middleton, J. T. 00146-A *12137-A
*05742-E 05680-F
*00279-G *00737-G
*01809-G 02299-G
*03606-G *03609-G
*03610-G *03611-G
*03612-G *03613-G
*03615-G *03616-G
*03617-G 05344-G
05903-G 00526-J
03614-K 07605-L
Mieville, R. L. *09745-M
Mikami, T. 03215-H
Miklosova, H. *00809-F
Miklska, A. 00809-F
Millar, G. H. 07626-B
Miller, C. A. 12663-D
Miller, D. L. 03680-D
Miller, E. B. *13783-E
Miller, E. L. 12172-M
Miller, L. *01440-F
Miller, M. R. *08536-E
Miller, R. R. 01999-D
Miller, S. *03524-H
Miller, W. J. *11210-M
Millman, S. *06994-C
Minaev, A. A. *02551-F
Minat, M. 03900-F
Minayev, A. A. 12284-F
Mingle, J. G. 01854-E
Minis, I. M. 04248-D
Mironova, A. F. *07302-F
Mirowska, E. 08021-D
Mnatsakanyan, A. V. *11270-F 02592-J
Moberg, J. L. *09766-J
Mokhov, L. A. 02439-D
Momotani, H. *00483-F
Monis, W. B. 03185-D
Monkman, J. L. 08502-D 08880-D
Monesano, R. 07340-F
Moohr, J. W. 07782-F
Moore, C. C. 05832-E
Moore, C. B. 15020-M
Moore, G. E. *00609-J *07427-D
Moore, J. F. 11204-J
Morgan, A. *07026-F
Morgan, J. J. 07026-F
Morgan, M. J. 11218-D
Morik, J. 16440-J
Moran, H. E., Jr. 04440-D
Morgan, D. J. *06608-D
Morgan, M. J. 15337-D 04329-D
Morgenroth, W. F. *01648-M
Morioka, S. 03902-F
Morishita, Y. 04143-D
Morossi, G. 15763-D
Morreal, J. A. 11030-D
Morris, G. R. 08557-B
Morris, J. P. *03352-B 02500-D
Morris, R. L. 00447-J
Morris, R. A. *05617-D
Morrow, J. I. 01419-D 04547-D 15541-D
Morton, F. *15851-M
Moskovskaya, K. A. *04037-F
Mountain, I. M. *10987-F
Mousseron, M. *16599-M
Mrose, H. *13974-D
Mudd, J. B. 07446-G
Mukai, M. *01902-B *02495-M
Mukherjee, N. R. *05047-M
Mushertt, A. E. *15969-D
Muller, N. 08408-E
Mullins, W. J. *10292-M
Mulvihill, J. W. *15078-M
Munroe, M. A. 00977-D
Munson, E. S. *16252-F
Murphy, S. D. *02223-F *03076-F
Murray, F. E. 00962-C 06719-E
Murthy, B. S. *04663-B
Myers, P. S. 00592-B
Nader, J. S. *00051-P 00620-D
Nader, J. S. *06723-D *01481-C
Nagasawa, S. *13666-M
Nakadoi, T. 00328-D
Nakayama, K. *07393-J
Nau, C. A. 04895-D 10767-D 04701-F *04702-F *04703-F
Naumann, P. *08337-M
Neal, J. 04701-F 04702-F 04703-F *04705-F *04706-F 04709-F 04710-F 04711-F 04712-F 04713-F 04714-F
Nebel, G. J. 05850-B *07637-B
Nedogibchenko, M. K. *08165-B
Nearman, J. C. *07626-B
Neiburger, M. *00510-C *03581-C *06043-C
Neiman, I. M. *04700-F
Neligan, R. E. *05097-B
Nelson, E. E. *14463-E
Nelson, S. S. 09734-D
Nemeth, A. *10045-M
Neronskii, O. G. *03937-D
Netzley, A. B. *09825-B *09830-B
Nevens, T. D. *01638-B
Newbury, B. C. 04080-D
Newell, H. A. 16277-D
Newhall, H. K. 01375-B *02335-B 13951-B 13544-M
Newman, D. J. *15765-E
Newton, J. W. *00231-M
Nichols, C. W. 05342-G
Nickels, S. W. 03103-D

*04960-D *03978-F
*05611-M
Niedrach, L. W.
*13688-M
Nielsen, B. J.
11296-F 00664-F
Niemeyer, L. E.
*04933-C
Niepoth, G. W. *01132-B
Nieuwenhuis, R. *07068-F
Nikberg, I. I. 07300-B
Ninomiya, J. S. 13034-M
Nippoldt, B. W. 06065-D
Nishida, K. 14487-B
Nissen, W. E. 02055-K
Nobe, K. 00097-E
05147-E 00101-M
01241-M 04617-M
*06250-E
Noble, W. M. 05485-G
03584-B
Noe, J. L. 02089-D
02798-D 02799-D
Nolan, M. *01202-J
Nomiyama, K. *03900-F
14494-F
Noro, L. 01794-F
Norris, C. H. 02323-D
Norris, L. A. *07908-M
Norris, R. M. *08109-F
Novack, R. L. 08082-E
Novak, J. 07432-D
Novak, J. R. 11188-M
*15491-M
Novikov, Yu. V.
*07306-F
Nowak, K. 10320-K
Nowakowski, P. *11615-B
Noyes, C. M. *16398-D
Nozaki, S. *06793-E

Oberdorfer, P. E.
*09341-B
Obiesender, K. *13989-D
Odaira, T. *15610-J
Ogata, M. *03652-F
Ohrn, Y. *04409-M
Ojakaar, L. 01636-F
O'Keefe, A. E. *11270-D
Okrent, E. H. 09148-B
Oldershaw, E. A.
*02258-M
Olusov, N. A. 15614-E
Oliver, F. W. 00235-G
Oliver, J. *05471-E
Olsen, C. R. 04829-F
Olson, D. R. 03266-E
10135-B

O'Neill, M. E. 15484-D
Ongun, A. *07446-G
Ordin, L. *06498-G
*06499-G
Ordoveza, F. E.
*00492-D
Orning, A. A. *05011-B
*05012-B
Orr, C. Jr. *00069-M
Ortman, G. C. 01828-C
*01823-D *00623-D
Osticini, L. 12499-M
Ostrovskii, M. N.
*02571-F
Otto, H. W. *16357-G
Ottoboni, F. 01358-M
Ouruseff, L. *05746-B
Ozersky, A. S. 10926-E
Ozershii, Yu. G.
14767-B
Ozolins, G. *00336-K
11224-J 09737-B
01890-B

Padovani, C. *03128-B
Padrta, P. G. 14607-D
Pagnotta, L. D. *06702-D
Pahnke, A. J. *09355-B
*14033-B
Paller, M. H. *15248-J
Painton, R. E. 04039-D
Palmes, E. D. 07027-F
Pan, C. H. *05294-F
00658-F
Papa, L. J. *09342-D
Parker, A. *07845-A
*07945-B
Parker, C. A. *02336-D
Parker, D. R. *09316-F
Parkin, N. R. 00469-D
Parmelee, W. H. 05155-E
Parson, D. *08394-B
Partsef, D. P. *04252-F
Patterson, G. C.
*06158-E
Pattison, J. N. *03264-B
03267-D
Patton, H. W. *05578-D
Paul, D. G. 05404-D
Paulus, A. O. 03613-G
Paulus, H. J. 14609-E
Paulus, J. 01991-D
Payne, J. Q. *04993-B
Payne, W. W. *05298-F
*01762-F
Pearsall, H. W. *09343-D
05170-D
Peatman, W. B. *14293-M

Padva, A. *00353-M
*00355-M
Prejack, E. R. *09172-M
Pentti, L. *15343-E
Perge, M. W. 14608-E
Perkins, R. W. 00173-C
Pesterfield, C. H.
*01626-B
Peters, J. M. *12955-F
Peters, K. H. 07366-J
Petricolas, W. L.
15055-M
Petri, H. *02969-F
Petrova, N. S. *11406-D
Pfaff, J. 00146-D
00386-D *00766-D
00860-D
Phillips, D. *02317-M
Phillips, W. F. 05092-D
Platt, V. R. *16159-E
Pierre, J. St. 01090-F
Pietta, L. H. *07097-D
Pigatzi, S. A. *03930-J
Ping, A. V. *01333-D
Pinigina, I. A. 02548-B
*02544-D *06903-D
Piper, R. *00746-B
Pires, E. G. 06546-G
Pirkle, C. I. 01051-F
Pirtle, V. *01794-F
Pitts, J. N., Jr.
*00601-C 00618-C
*00709-C *00935-L
07257-C 00698-M
00917-M *01210-M
02469-M *02496-M
*05100-M 08877-M
10512-M 10519-M
*12169-M
Plate, R. L. 11307-F
Platt, T. S. 06078-G
Pless, L. G. 04663-B
Plust, H. G. *07853-B
Poglazova, M. N.
*07188-M
Pohoreski, R. *07495-M
Poirier, A. R.
*04233-B
Poletaev, M. I.
*04099-D
Poletayev, M. I. *08132-D
Popov, V. A. *07830-D
15481-M
Porter, B. *15019-M
Potter, A. E., Jr.
04483-M
Powers, J. W. 03064-C
Pozlomek, E. J. *04285-M
Prager, M. J. *01451-D

Pratte, E. 09365-B
Prescher, K. E.
03369-D
Pressman, G. 06994-C
Preston, K. F.
*09070-M
Price, M. A. 03112-D
Prietsch, M. 00562-E
08803-L 16475-L
Prindle, R. A. *00375-B
Propst, B. 05777-G
06498-G 06499-G
Proulx, L. J., Jr.
*05895-J
Pueschel, R. 06632-C
02412-M
Purcell, J. E. 01244-C
Purcell, T. C. 01693-D
*06333-M
Pursell, B. R. *15769-B
Pustinger, J. V., Jr.
04234-B *08033-B
*03820-D
Pybus, F. C. *01020-F
Pylev, L. N. 06268-F

Qader, S. A. *10775-B
Quo, S. S. 01629-F
01630-M

Raabe, V. E. 07463-M
Rabinovitch, B. S.
*05051-M
Rademaki, J. L.
03962-F
Raschka, G. J.
*03409-J
Rasmussen, R. A.
*05756-B
Ray, S. K. *01008-B
Rayher, W. *06146-A
Raymond, L. *03851-E
Razumov, V. A.
*06894-D
Reamer, H. H. 03508-M
*05643-M *11263-B
Rebbert, R. E.
01233-M *01824-M
*02243-M *03559-M
01683-D
Reckner, L. R. *03542-D
*00251-J
Rector, D. D. *06196-F
Redkin, Yu. R. 11914-J
Reed, C. F. *15869-M
Reed, L. E. *00221-B
Reed, R. D. *04838-E
Reeds, J. R. *15012-M
Rees, W. T. 02336-D
Rehwoldt, R. E.
*13270-M
Reichardt, I. 08257-D
Reichelt, H. 09738-D
Reid, F. H. *11164-D
Reid, R. S. *01854-E
Reid, W. T. *11765-B
Remy, H. *13870-M
Rengstorff, G. W.
*06611-E
Renzetti, N. A. 05819-F
*01596-F *05113-F
*05849-M *07108-M
Reynolds, R. G. 02762-J
Rhodes, E. H. *04013-E
Richards, R. L. *05903-G
Richardson, A. *06858-D
Richter, G. N. *03588-M
Ridgway, S. L. *07613-E
Rigdon, R. H. *06266-F
04705-F *04709-F
*04710-F *04711-F
*04712-F 04713-F
04714-F
Ripp, G. Kh. 07575-D
Ripperton, L. A. 01579-M
03107-M 05605-G
02747-D
Risebrough, R. *16318-B
Rispler, L. *01228-B
Rispoli, J. A. 11087-B
Rizzaney, V. A. *01916-F
Rjwar, D. P. 05414-E
Robb, E. W. *13668-B
Robertson, D. H. 03354-D
Robinson, C. B. *00534-J
Robinson, F. R. 09028-F
Robinson, J. 06858-D
Robinson, J. W. 01205-D
04716-D
Robison, C. B. *07448-J
*07846-E
Rock, S. M. 00224-D
Rockind, M. A. *06070-D
Rodgers, A. S. 03087-M
*03078-M
Roester, J. F. 00268-B
Rogers, L. H. 00020-B
Rogus, C. A. *02153-D
Rohrman, F. A. 01838-B
Romanovsky, J. C.
06600-F *00345-C
Rondle, D. *04014-D
*04053-D
Ronna, A. M. *15119-M
Roschig, M. *05456-D
Rose, A. H., Jr. 01411-E
*04630-B *01413-B
01837-B *01846-B
*02344-B *00027-B
*03420-B *03562-B
02378-D
Rosen, A. A. *07089-B
Rosenlund, I. T.
11548-E
Rosenstein, L. *15862-E
Ross, C. R. 01228-B
Ross, J. M. 00264-D
Ross, L. W. *08463-B
Ross, R. G. 15526-E
Rossano, A. T. *11165-D
*07604-L
Rossi, S. 03955-D
Rosso, A. J. 01038-B
Rostenbach, R. E. 04960-D
Roth, E. M. *11241-F
Rothe, W. *13913-E
*15327-E
Rothman, S. S. *01687-B
Rothwell, E. *05084-D
Rounds, D. M. *01062-F
*02373-E
Rounds, F. G. *05170-D
Rowe, N. R. *02764-L
Rowson, H. M. *08352-E
Rubnitz, M. E. 06710-F
Ruchkovskii, B. S. 06886-J
Ruhemann, M. *15048-M
Ruhnke, L. *01197-E
Ruschenburg, S. *11912-E
Rustneva, A. P. *06683-F
Ryan, J. M. *08393-B
Ryasanov, V. A. *05962-D
*05940-L
Ryden, L. L. *15970-M
*16083-M
Ryshov, V. P. 16463-M

Saalfeld, F. E. *05257-D
Sachdev, S. L. *04716-D
Sadivnikova, A. G.
07304-J
Saffiotti, U. *00754-F
*00942-F *07340-F
Sage, B. H. *10475-B
*09046-M
Saito, T. *12967-B
*13497-E *14193-E
*15895-E
Saitoh, T. *16132-D
Sakabe, H. *00461-D
Sakamoto, H. *04742-D
Saturai, H. 07368-F
Salama, C. *15134-M

Salooja, K. C. *16484-E
*03965-M *04926-M
*12058-M
Salyamon, G. S.
*04086-D
Saltzman, B. E.
*01650-C *03544-D
Samadov, I. G. *03934-F
Samoilovich, L. N.
*11914-J
Samoilovich, L. N.
*11914-J
Sanders, W. N. *09574-D
Sanderson, D. E.
01318-M
Sandomirsky, A. G.
*00257-E
Saruta, N. *16542-F
Sato, S. *04142-F
Saunders, R. A.
*03829-D *06624-D
Sauvageau, P. 09030-M
Sawicki, E. *00011-D
*00114-D *00146-D
*00203-D 00230-D
*00386-D *00440-D
*00479-D *00624-D
*00765-D 00766-D
*00767-D 00768-D
*00867-D *00868-D
00911-D 00912-D
*00926-D *00927-D
*00928-D *00931-D
*00954-D *00998-D
*01232-D 01696-D
*01720-D *01735-D
*01781-D *01795-D
*01817-D *01922-D
*01973-D *01944-D
*01995-D *01997-D
*01999-D *02077-D
*02078-D *02079-D
*02080-D *02081-D
*02083-D *02084-D
*02085-D *02086-D
*02087-D *02088-D
*02089-D *02090-D
*02091-D *02092-D
*02094-D *02095-D
*02096-D *02097-D
*02226-D *05327-D
*02795-D *02796-D
*02797-D *02798-D
*02799-D *02801-D
*02803-D *02805-D
*02843-D *03080-D
*03081-D *03253-D
*03523-D *04029-D
*04328-D 05319-D
07878-D 09597-D
*11091-D *00518-F
*00870-F *00111-J
*00626-J 01471-J
*02225-J *02944-J
Sawyer, R. F. 06433-D
06435-D 10045-M
Scassellati-Sforzolini, G.
*06808-B
Schaad, R. *16336-J
Schadt, C. F. 13040-J
Schafer, L. J. 01089-J
Schaldenbrand, R.
*07638-B
Scharf, P. B. *07451-B
Scheel, L. 07068-F
Scheer, R. D.
07498-M *07509-M
Scherber, F. I.
*16170-D
Schiele, G. *10568-E
Schiemann, G. *02973-E
*16207-M
Schieff, R. I. 03184-M
Schiechter, M. M.
01632-M
Schlesinger, M. D.
*08391-B
Schlipkoeter, H. W.
*02963-D *08274-F
*16219-F
Schmertzing, R.
*09751-B
Schmidt, C. F. 06017-F
Schmidt, F. R. *11094-C
Schneider, R. A.
*06017-F *07510-M
Scheff, E. P. 08331-F
Schonauer, G. *02657-D
Schrotz, V. 13713-M
Schuch, E. A. *03883-B
*00618-C *01602-C
06052-D 01596-F
*01603-F *05819-F
02496-M
Schuenemann, J. J.
*00599-A 03404-J
03458-J *09209-J
Schuette, F. J.
*02806-B *01876-D
08270-D
Schuetze, R. *13865-E
Schulte, J. *00538-E
Schulz, E. J. 04049-D
Schulz, H. 10539-E
Schulz, K. R. 16356-F
Schumacher, R. 02798-D
Schumann, C. E.
*05336-J
Schumm, D. E. 09024-F
Schuttmann, W. *07956-F
Schwabe, K. 14450-M
Schwartz, C. H. 05011-B
05012-B
Schwartz, R. D. *07395-M
Scofield, F. *16362-B
Scott, M. K. 07898-D
Scott, W. E. 05818-C
02796-D *05572-D
02795-D *05827-J
00251-J
Scully, D. B. 03986-M
Seery, D. J. *13931-M
Seidman, S. *02537-G
Seinfeld, J. H. 15310-B
Seisinger, D. E. 00241-J
Seleznev, B. E. *02569-D
Selucky, M. *07432-D
Senderkhina, D. F.
*08136-D
Senderikhina, D. F.
*07156-D
Serat, W. F. *04635-D
Sershentova, N. N.
04095-D
Setser, D. W. 05051-M
Setzer, H. *06479-E
Severs, R. K. 03965-D
03966-D
Seyer, W. F. *16040-M
*16054-M
Shabad, L. M. *10099-G
*05504-F *06268-F
*07301-F *14422-F
*03935-B *07400-D
Shabaker, R. H.
09106-B
Shaffer, N. R. 03462-J
06031-B
Shafner, A. 13867-F
Shapiro, D. D. *04109-F
Shapiro, H. *15273-M
Sharkey, A. G., Jr.
*14173-D
Sharma, R. K. *04667-D
Sharp, J. H. 07097-D
Sharpe, L. M. *09759-B
Shaw, R. *05425-M
09700-M 07457-M
Sheehy, J. P. *00220-A
Shen, L. *05954-F
Shepherd, M. *00224-D
Sherman, A. *14258-M
Sherrell, F. G. *02460-D
Sherwood, P. W. *08479-E
Shevkun, G. N. 11486-D
Shimose, T. 13416-M
Shiragawa, K. 07375-D

Shively, J. F. 00730-J
*06430-J
Shizuo, Y. *14353-E
Sholl, H. *08493-B
*14487-B
Shook, W. G. 09370-K
Shtern, V. Y. *15238-M
Shubik, P. 08004-F
07785-F
Shulman, H. L. *02374-M
Shultz, J. F. 00015-E
Shultz, J. L. 14173-D
Shvarts, Y. I. *00163-J
Sidorina, I. Yu. 07818-C
Siegel, J. *03622-F
Sigsby, J. E., Jr.
*05135-D 01926-D
*04796-D 09152-B
00542-D *02375-B
00271-B
Sigworth, H. W.
04093-B
Simmers, M. H. *08015-F
*02276-F
Simonaitis, R. 00935-C
*10812-M
Simonsen, R. N. 03872-E
Singer, J. M.
*04653-M
Singh, T. *06443-D
Sipple, H. E. 07187-B
Skala, H. *14807-D
Skanavi, M. D. 05184-B
Skarstrom, C. 15063-M
Skeel, R. T. 07089-B
Skunca, I. 14074-B
Skvortsov, A. N. *06305-E
Skvortsova, N. N.
*10631-B
Slater, D. H. *07512-M
11239-M *11246-M
Slater, W. L. *04668-M
Sleva, S. F. 03727-D
02161-D 02162-D
Slutsky, S. *13690-M
Small, M. 01302-D
02169 J 01025-F
Smolyanskii, Z. B.
07789-L
Smirnova, V. G.
06893-D
Smith, C. G. *10767-D
Smith, C. W. *09086-M
Smith, D. S. *02527-B
*06436-D
Smith, E. T., Jr.
*04940-D
Smith, G. F. *06820-F
Smith, G. T. *06163-F
Smith, G. V. 00293-D
Smith, I. D. *05649-B
Smith, I. G. 12086-B
Smith, J. E. 02812-M
03732-D
Smith, M. 07783-F
Smith, M. E. 11010-B
Smith, R. 01413-B
04630-B 07885-D
*02378-D *04596-D
06336-E
Smith, R. P. *04723-F
04927-F
Smith, S. B. *03425-D
Smith, S. H., Jr.
00103-E
Smith, T. *09002-F
Smith, W. D. 01461-D
*06610-D 06057-J
Smith, W. E. 01440-F
Smith, W. S. *00030-B
Sobolev, I. *15032-M
Soda, B. 04206-D
10946-D *12949-M
Sokolowski, M. S.
*03363-J
Solomin, G. I.
*02566-F *03933-F
*05949-F
Samasat, S. *07204-A
Sonley, J. M. 09365-D
Sorenson, S. C.
*13951-B
Soulages, M. L.
*01230-D
Sourirajan, S.
*08207-E
Spencer, C. F. 02204-M
Spencer, E. F., Jr.
*03762-E
Spencer, J. M.
*06219-F
Sperling, F.
*07332-F
Spindt, R. S. *00277-D
Springer, K. J.
*06039-B *11254-B
*01867-E *04688-E
Squire, E. C. 09365-B
Squires, A. M.
*06488-B
Stakman, R. G. 03562-B
03989-B 00936-E
*01411-E 02244-E
Stanescu, L. 08321-D
Stanilewicz, M.
*06021-D
Stanley, T. W.
00011-D 00114-D
00203-D 00399-D
00479-D 00624-D
00867-D 00927-D
00934-D 00998-D
01232-D 01729-D
01735-D 01787-D
01925-D 01926-D
01979-D 01995-D
01997-D *01998-D
02078-D 02080-D
02085-D 02087-D
02091-D 02092-D
02094-D 02096-D
02795-D 02801-D
*04329-D *06200-D
*11093-D *11218-D
15337-D 00770-M
00869-M 02082-M
Starkman, E. S.
*01376-B *01565-B
02527-B *05411-B
*10044-B *13544-M
Starshov, I. M. *14773-D
Statsek, M. K. *07574-F
Staudhammer, P. 05966-E
Steadman, B. L. 06196-F
Stehar, R. F. *05339-D
Steel, C. 02528-M
Stefanescu, A. *08321-D
Steger, E. *14470-D
Stelgerwald, B. J.
*03543-B 00763-C
Stein, R. G. *03796-E
*03797-E *07607-M
Steinbach, W.
08373-B
Steinfeld, J. I. 15019-M
Stemmer, R. L. 09435-F
Stenburg, R. J.
*02230-B *06086-B
*02233-D
Stephens, E. R.
03264-B *02476-C
*05817-C *05818-C
*01208-D *03112-D
08572-D 03595-B
*03618-B 05627-J
*00236-M *02861-M
*11050-M
Sterba, M. J. *03289-I
Stern, A. *03085-A
*01654-B *02951-B
*05822-E
*07893-E
Sternberg, H. W. *10039-M
Sternlicht, D. 14202-E
Stevens, R. E. *04839-D
Stevenson, H. J. R.
*01318-M

Steward, R. C. 03547-A
Stewart, R. D. *00747-D
*04124-F *05561-D
Stephenshily, A. I.
*14365-M
Stickel, R. 06127-E
Stock, P. *03886-F
Stockman, R. L.
01949-J
Stocks, P. *03088-F
*03526-J *04061-F
Stockton, E. J.
09370-K
Stoever, M. 06235-C
Stohlinger, H. E.
*04544-G
Stone, R. F. *14127-B
Stopps, G. J. *05418-F
Story, P. R. *00585-M
Stoudenmire, J. H.
16170-D
Stout, B. M., Jr.
*11259-F *11260-F
*11261-F
Strating, J. 16626-M
Strong, A. A. *01495-D
Struck, J. H. 07638-B
Struck, R. T. 04022-M
Stuart, R. A. *05056-D
Sturgis, B. M. *07627-D
Styles, H. E. *07596-B
*16024-B
Sugiyama, K. 03652-F
Sukhareyeshaya, T. M.
06526-F
Sullivan, J. H. *03354-D
Sullivan, J. L. 05675-J
Sullivan, R. E. *09329-E
Sumegi, I. 05729-F
Sunderman, D. N. *06682-D
Suppan, P. *09082-M
Susan, S. *11239-M
Suter, C. M. *16082-M
Suter, H. R. *07620-E
Suzuki, T. *06744-A
Suzuki, Y. *05461-D
14126-D
Swann, H. E., Jr.
*00779-F *02277-F
Swann, M. H. 03991-D
Swarts, D. J. *06104-B
Sweeney, M. P. *00155-D
*03267-D
Sweeney, W. J. *02428-B
*03867-B
Swinnerton, J. W.
*14158-M
Syczewska, K. *07403-D
Tabor, E. C. *00388-B
*00793-D *03426-J
Tada, O. *06112-D
*13154-D
Taeuber, K. E. 03486-E
Talbot, R. B. 00176-F
Tamagno, J. 13580-M
Tanimura, H. *07335-D
*11015-J *14679-J
Tanner, R. L. 08105-M
Tarkhova, L. P. *06892-F
Taylor, F. R. 03542-D
Taylor, J. R. 05575-C
Taylor, O. C. *00009-G
Taylor, R. E. *14036-E
Tebbens, B. D. *01798-D
*01358-M *02203-M
02495-M
Teeter, R. M. *02204-M
Teichner, W. H. 11241-F
Tendron, G. *03116-G
Termeulen, M. A.
*02017-B
Teske, W. *11058-E
Tessier, E. C. *11234-E
Theiss, E. 04539-F
Theones, H. W. *11061-D
Thom, R. G. 07165-F
Thomas, A. A. 00096-F
*00429-F *04736-F
*10613-F *11593-F
Thomas, G. *09803-B
Thomas, J. F. 01907-B
08359-B 01798-D
08364-D 04551-F
02203-M
Thomis, J. M. *02205-D
Thomas, M. D. *03396-G
Thomas, R. S. 07427-D
Thomas, T. F. *02528-M
Thomas, W. J. *09197-M
Thompson, C. J.
*08118-M *13779-D
Thompson, R. N. *04895-D
Thompson, W. B. *01133-B
Thornton, D. F., Jr.
*04658-E
Thorton, M. 04706-F
Tiffany, W. B. *15139-M
Tighe, J. *04631-D
Tillman, J. H. 03505-J
Tilson, S. *00984-A
Timmins, G. W. 06471-D
Tinkham, L. 10662-B
Tipson, R. S. *03234-D
*00098-M *09200-M
Tkach, N. Z. *07573-F
Tkachev, P. G. 05969-D
Todd, E. 16040-M
Todd, G. W. *03627-G
*03629-G *03630-G
*05777-G *05778-G
Tolliver, W. H., Sr.
*00447-J
Tomingas, R. 01714-D
02548-E 02689-F
06339-F 09713-F
11572-J 11571-M
Tomioka, T. *02142-E
Tomita, K. 02061-J
Tope, O. *07952-F
Tompkins, E. E. 05345-M
Toshida, O. *15772-E
Toth, B. *07785-F
Tow, P. S. 15941-E
Trevnicek, Z. *02060-M
Treyser, D. A.
*14650-E
Troffiov, V. N. *05184-B
Trot'yatova, V. A.
*03924-D
Trofimova, L. V. 08524-B
Truitt, D. *01205-D
Tsay, R. S. *06625-M
Tsuda, M. *15909-D
Tsuptsov, M. T. *04254-D
Tubina, A. Ya. 16730-D
Tunsday, E. S. *02837-M
02636-M 03114-M
*03428-M
Tugarinova, V. N. 05231-F
Tupeeva, R. B. *08433-D
Turk, A. *01419-D
*04547-D *15541-D
Tsaros, C. L. 08390-B
Tsulaya, V. R. *08431-F
Turner, D. 02635-B
Tye, R. *09436-F
*01453-B *01396-D
Tyler, W. E. *05929-E
Uhaidullaev, R. *03918-J
Ulrich, C. E. 02223-F
Umstead, M. E. 15486-M
*05057-J 00060-D
15529-D
Ung, A. Y. *03184-M
Upham, J. B. 02360-M
Uphold, W. M. *07964-F
Urone, P. *02812-M
*03732-D
Uyehara, O. A. 14045-B
Valenzuela, P. 13078-M
Valori, P. 16352-B
*09389-B *08296-B

*09368-D
Van Sickle, D. E.
*05058-M
Vander Kolk, A. J.
*08290-D *00848-D
Vanderwerf, D. *02667-M
Varshavskaya, S. M.
02596-F
Varshavskiy, I. L.
*10444-E
Vasil'eva, A. A. 04091-J
Vaskov, V. I. *02601-D
Vassiliou, E 02188-D
Vaughan, T. R., Jr.
*11632-F
Veber, A. 08475-M
Velkoff, H. R. 09172-M
Venezia, R. A. 01604-K
11224-J
Venosky, D. L. *03185-D
Vehos, J. 07598-B
Vernot, E. H. 03813-F
Vieth, W. R. 15183-M
15184-M
Viles, F. J. 04419-B
Vingiello, F. A.
*01628-M *01630-M
*01631-M *01632-M
*01634-M *01635-M
*01633-M *01629-F
*01636-F
Violet, P. *07408-J
Virgil, G. *09385-B
Virtes, J. *16363-D
Volnov, A. N. 04610-E
Voltonka, G. A. 04107-F
Volkova, A. P. 02601-D
Vonnie, R. A. 02433-D
*00862-D
Von Becker, H. 07373-D
Von Lehmden, D. J.
05005-B 01766-B
*00621-B 02233-D
Vrebos, J. 16324-B
Vysamyae, A. Yu. *08210-F

Wade, D. T. *09347-B
Wade, R. H. *00264-D
Wagner, T. O. *14660-B
Walker, J. A. *02636-B
Wall, R., Jr. 15392-B
Wallace, T. J. *05208-M
Wallack, S. 06284-D
Wallcave, L. *14301-D
Waller, R. E. *00986-B
04651-J
Walsh, J. T. *07850-F
Walsh, R. 01682-M
*03088-M *00120-M
Walsh, R. P. 10428-B
Walsh, W. K. 04454-M
Walters, D. F. *09835-B
Wan, J. K. S. 12169-M
01210-M *02489-M
*02493-M 00916-M
*00925-M
Wang, C. C. *04500-F
Want, M. C. *01186-M
Warren, G. B. *02956-B
Warren, H. V. 01971-F
Wartburg, A. F.
01983-M 03448-D
Wasser, J. H. *05133-B
*11231-B
Wasserman, M. *10105-F
Watanabe, H. *00328-D
*02061-J
Watkins, C. D. *02875-D
Watson, E. S. *03430-D
Way, G. *07629-B
Wayne, L. G. *05176-F
*10456-F *04645-F
*05824-M
Weaver, E. E. *14459-E
*13034-M
Weaver, M. K. *14772-L
Weber, D. L. 10119-M
Weedfall, R. O. *11052-C
Weete, J. 10028-M
Weete, J. D. *10118-F
Wei, R. *08827-M
Weig, D. W. 16017-B
Weigel, J. E. 12084-B
Weil, C. S. *00915-F
Weiner, M. 15784-M
Weisburd, M. I. (Compiler and ed.)
*00975-B
Weisburger, E. K.
01692-F
Weisburger, J. H.
*01602-F
Weiss, B. 08294-D
Weiss, S. M. *09818-B
Wen-Yeh, H. *07782-F
Went, F. W. 05756-G
04998-G
Wentworth, J. T.
*07632-B
Wentworth, W. E.
*00119-M
Werner, M. J. 05536-D
West, P. W. 00492-D
Westchester, J.
*02112-E
Weston, G. *02152-B
Westlake, E. F., Jr.
09023-B
Westphal, 15575-J
Westveer, J. A. *09348-D
Wettig, E. *06634-D
*02581-D
Wetzel, R. E. 02822-J
Wheatley, G. A. *16526-B
Wheatley, R. N.
*11171-B
Whitby, K. T. *07071-M
*07273-M *06203-D
*02433-D *08445-D
Whitehead, J. K.
05084-D
Whitehouse, A. G. R.
*13636-M
Whitman, N. E. *07061-D
Whytock, D. A. 08353-M
Wicke, A. F. *13465-M
Wiese, W. M. 03456-E
Wilde, M. P. V. *16439-M
Wilhoyte, H. J. 08536-E
Wilke, S. S. *02472-M
Will, E. 01197-E
Williams, A. F. *10075-B
Williams, D. T. 07981-D
Williams, G. C. 02253-M
Williams, G. L. 11254-B
Williams, I. R. *01178-D
*00802-J 05652-J
Williams, J. D.
*03027-J *00847-J
*01890-B 03449-D
Williamson, J. E.
09825-B
Wilson, H. N. *09369-D
Wilson, K. W. 06104-B
*15354-D
Winner, D. R. 14975-E
Winde, H. 15329-M
15439-M
Windsor, M. W. *11188-M
15491-M
Winefordner, J. D. 11567-D
Winkler, G. L. *15083-B
Winkler, R. 02066-B
Winkler, P. 14811-M
Winkstrom, L. L.
*00097-E
Wiseley, D. V. 01015-F
Wiser, W. H. 10775-B
Wisman, A. 00673-B
Wohlers, H. C.
*08066-D *03104-J
Wolfe, R. N. *08496-F
Wolstenholme, E. F.
*16507-D
Won, W. D. *04551-F
Wong, E. L. *04483-M

Wong, F. F. 13062-M
Wong-Woo, H. 07844-B
Wood, F. C. *10458-E
Woodcock, R. F. 14227-M
Woodland, R. G. *04535-E
Woodruff, R. 07884-E
Woods, F. J. *15486-M *00060-D *05209-E
Woolrich, P. F. *04590-M
Wozniczek, H. *01534-B
Wright, R. 15744-M
Wyant, R. E. *07898-D
Wyeth, H. W. G. *06471-D
Wykes, A. A. *03985-F
Wynder, E. L. *01206-F *01613-F *04553-F *04590-F 06106-B
Wyrick, D. D. 15182-M

Yakovlev, V. I. 04581-E
Yamamuto, R. K. *10772-D
Yamamuto, T. 08493-B
Yamate, N. *15911-M *15171-D
Yamazaki, K. *04374-E
Yanchova, N. V. *02600-E
Yantovskii, S. A. *07518-C
Yanyshova, N. Ya. *04108-B *02573-B
Yardley, J. T. *15020-M
Yates, W. O. 04318-D
Yeich, R. A. *11540-D
Yermakova, I. V. 04102-D
Yocum, J. E. *11227-A *06966-J *04770-J 14997-J
Young, M. A. *05790-F
Young, R. A. *16485-M
Young, S. W. *13467-L
Yuldashev, T. *12272-F *06895-F
Younquist, G. R. *01891-M 02374-M
Yuki, K. *08471-D
Yunghans, R. S. *00977-D
Yuster, S. T. *05966-E

Zajac, W. W., Jr. 01631-M 01633-M
Zawadski, E. A. 01362-B
Zdrojewski, A. *07908-D 06380-D *07436-D *00141-D 08643-D 08644-D
Zeschmann, E. G. 16298-B 07224-E 08604-E 07223-E
Zesso, G. 07204-A
Zhdanov, S. P. *04484-D
Zhuravleva, M. A. 06876-D
Zielke, C. W. *04022-M
Zigler, M. G. *05092-D
Zikanova, A. *16346-M
Zil'berg, L. A. 08163-J
Zimmer, C. E. 00321-J *00739-J
Zimmerman, P. W. *04984-G
Zimmermann, F. K. *14709-M
Zimin, E. P. *15481-M
Zlobina, N. S. *04084-F
Zorina, L. A. *08526-F
Zur Muehlen, T. *15287-J

TITLE INDEX

Abs:.. the Process-Technique of th: Combustion of Exhaust Gases in Gasoline Engines in Stationary Operations. 08468-E

Abscission: The Role of Ethylene, Ethylene Analogues, Carbon Dioxide, and Oxygen. 11100-B

Absorbent for Providing Clean Air in Submarines. 03145-E

Absorbents in Microanalysis, IV. Adsorption Properties of Silica Gel in Simultaneous Determination of Carbon, Hydrogen, and Iodine or Carbon, Hydrogen, and Sulphur. 14420-B

Absorption and Chlorine Oxidation of Sulfur Compounds Associated with Kraft Mill Effluent Gases. 00379-B

Absorption and Excretion of Benzpyrene when Fed to Mice. 04705-F

Absorption and Extraction of 3,4-Benzpyrene with Specific Types of Soot. 02669-F

Absorption on Excretion of Benzpyrene Observations in the Duck, Chicken, Mouse, and Dog. 04709-F

Absorption of Polar Substances on the Solid Support of Column Packing in Gas-Liquid Chromatographic Analysis of Air Contaminants. 03949-B

Absorption Regeneration Approach to the Problem of Evaporative Control. 08537-E

Accuracy of Chromatographic Analysis of Five Gases when using Thermocatalytic Detectors. 10230-B

Acetylene Determination in the Air by Infrared Spectroscopy. 04102-B

Activated Silica Gel as an Adsorbent for Atmospheric Contaminants. 01123-B

Acute and Chronic Toxicity of Some Halogenated Derivatives of Methane and Ethane. 09074-F

Acute Effects of Nitro-Olefins Upon Experimental Animals. 03602-F

Acute Effects of Turpentine Vapor on Rats and Mice. 07332-F

Acute Gasoline Intoxication. 04500-F

Adsorption of Benzene Vapor From an Air Stream, by Beds of Charcoal. 04074-E

Adsorption of Benzene Vapor From an Air Stream, by Beds of Charcoal, II. The Rate-Controlling Mechanism. 04071-E

Adsorption of Binary Hydrocarbon Gas Mixtures on Activated Carbon. 08056-M

Adsorption Equipment. 09793-E

Adsorption of Gases by Active Charcoal. 13076-M

Adsorption of Metal Ions From HF-HCl-ICl Mixtures on Some Ion Exchange Papers. 13409-M

Adsorption of Mixed Vapors. 15012-M

Adsorption Processes. 15157-M 10486-E

Adsorption Properties of Active Carbon, II. Preliminary Study on Adsorption of Various Organic Vapors on Active Carbon by Gas Chromatography. 04848-B

Adsorption-Regeneration Approach to the Problem of Evaporative Control, 16020-E

Adsorption by Silica Gel, II, 13783-E

Adsorption or Solution of Methane and Other Gases in Coal, Charcoal, and Other Materials, 13766-M

Aerosol Formation in Natural and Polluted Air, 05479-B

Aerosol Spectrometer and its Application to Nuclear Condensation Studies, 06231-B

Aerosol Studies by Light Scattering, II, Preparation of Octanoic Acid Aerosols of Narrow and Reproducible Size Distribution, 02936-M

Aerospace Toxicological Research, 04738-F

Airborne Carcinogens and Allied Compounds, 00518-F

Air-Borne Oxidants as Plant-Damaging Agents, 03608-B

Air Conservation Report Reflects National Concern, 02237-A

Air Contaminants, 09786-B

Air-Guard System for Control of Exhaust Emission, 02406-E

Air Pollutant Emissions From Coal-Fired Power Plants; Report No. I, 05067-B

Air Pollutant Emissions From Coal-Fired Power Plants, Report No. II, 03113-B

Air Pollutant Emission Inventory of Northwest Indiana, (A Preliminary Survey, 1966.) 09737-B

Air Pollutants, 06486-B

Air Pollutants and Plant Response 14968-B

Air Pollutants from Power Plants (Techniques for Evaluating Air Pollutants), 03592-B

Air Polluting Fires from the View Point of Health Protection of the Population in Residential Areas, 07230-B

Air Pollution, 00984-A 09063-E 02129-J

Air Pollution Abatement, Survey of Current Practices and Costs, 13551-E

Air Pollution and its Abatement in the United States, 02951-A

Air Pollution and Acute Respiratory Illness, 09440-F

Air Pollution from Aircraft in Los Angeles County, A Report of the Engineering Division, Dec. 1965, 06031-B

Air Pollution and Allergy, 01794-F

Air Pollution-Part IV - Analysis of Pollutants, Chapter 18 - Analysis of Organic Gaseous Pollutants, 00108-B

Air Pollution and the Automobile, 03861-E 08633-B

Air Pollution From Automobiles in Philadelphia, 00879-B

Air Pollution with 3,4-Benzpyrene from Petroleum and Chemical Industries, 11914-J

Air Pollution in the Birmingham, Alabama Area, 03458-J

Air Pollution, Bronchitis and Lung Cancer, 08815-F

Air Pollution and Cancer Mortality in Liverpool Hospital Region and North Wales, 03506-F

Air Pollution with Cancerogenic Substances, 01844-F

Air Pollution in Charleston, South Carolina. 03606-J

Air Pollution/Chemung County Supplement to Comprehensive Area Survey Report Number One (Greater Elmira). 04034-J

Air Pollution in the City of Athens and Surrounding Territory. 00117-J

Air Pollution in a City Street. 00985-B

Air Pollution from Commercial Jet Aircraft in Los Angeles County. 04792-B

Air Pollution and Community Health. 00375-B

Air Pollution and the Compression-Ignition Engine. 15118-B

Air Pollution Control in Connection with DDT Production. 01616-F

Air Pollution Control by Direct Flame Incineration in the Paint Industry. 07836-E

Air Pollution Control-Economic Impact of Growing Problem. 00369-K

Air Pollution Control Equipment for Cars. 15156-E

Air Pollution Control Field Operations Manual, A Guide for Inspection and Enforcement. 00976-B

Air Pollution Control by Oil Refineries. 02017-B

Air Pollution Control Primer. 09780-A

Air Pollution Control-Problems for the Automotive Engineer. 07893-E

Air Pollution Control for Screw Machine Operations. 08406-B

Air Pollution Control Systems. 10960-D

Air Pollution Damage to Agricultural Crops. 03609-B

Air Pollution and Disease. 07102-F

Air Pollution Effects of Incinerator Firing Practices and Combustion Air Distribution. 00027-B

Air Pollution Effects on Vegetation. 03472-B

Air Pollution in the El Paso, Texas Area. 03606-J

Air Pollution Engineering in Los Angeles County. 04962-E

Air Pollution Engineering Manual. 09784-B

Air Pollution in Erie County (Comprehensive Area Survey Report Number Two). 02613-J

Air Pollution From Fuel Combustion Processes in Philadelphia. 07550-E

Air Pollution in the Growing Community. 08671-K

Air Pollution by Hydrocarbons. 15154-J

Air Pollution Injury to Crops. 03610-B

Air Pollution Inventory-Enter the Diesel. 00241-J

Air Pollution in Jacksonville, Florida, A Pilot Study - Aug.-Sept. 1961. 00220-B

Air Pollution in Japan. 08744-A

Air Pollution in Localities with Heavy Traffic in Metropolitan Cities. 09395-B

Air Pollution and Lung Cancer. 04589-F 15345-F

Air Pollution and Your Lungs. 02357-F

Air Pollution Measurements in Baltimore, Md. (March and April 1964). 02825-J

Air Pollution Measurements in Indianapolis (June-July 1963). 02822-J

Air Pollution/The Mid-Hudson: Greene, Ulster, Rockland, Columbia, Dutchess (Comprehensive Area Survey Report Number Six). 05008-J

Air Pollution by Motor Car Exhaust Gases. 01834-B

Air Pollution by Motor Vehicle Exhaust Gases. 11457-B

Air Pollution from Motor Vehicle Gases in Tokyo and Osaka. 15810-J

Air Pollution by Motor Vehicles. 06791-B

Air Pollution from Motor Vehicles. 00967-B

Air Pollution Nassau County (Comprehensive Area Survey Report Number Four). 05009-J

Air Pollution in the Netherlands. 14479-A

Air Pollution-Niagara County (Comprehensive Area Survey Report Number Three). 04804-J

Air Pollution in Northern Kyushu. 06780-J

Air Pollution in Norway, I. General Air Pollution in Norwegian Cities and Industrial Towns. 13952-B

Air Pollution in Norway, III. Correlations Between Air Pollutant Concentrations and Death Rates in Oslo. 13953-F

Air Pollution and the Oil Industry. 03871-B

Air Pollution Patterns in the Greater Birmingham Area. 00834-J

Air Pollution: Photochemical Aspects. 03058-A

Air Pollution: Photooxidation of Aromatic Hydrocarbons. 01978-M

Air Pollution and Plant Response in the Northeastern United States. 05420-B

Air Pollution and Protective Coatings: Houston, Dallas, and Washington. 10083-K

Air Pollution Program, National Bureau of Standards. 01981-B

Air Pollution Regulation of Non-vehicular, Organic-Solvent Emissions by Los Angeles Rule 66. 07483-K

Air Pollution with Relation to Agronomic Crops: V. Oxidant Stipple of Grape. 05903-B

Air Pollution Research Planning Seminar. 00174-F

Air Pollution Research Progress Report for the Quarter Ended March 31, 1960. 00838-B

Air Pollution (Review of Application of Analysis). 03874-A

Air Pollution from Rooms Heated by Stoves Using "Liquid Gas". 09305-B

Air Pollution in St. Bernard, Ohio. 03426-J

Air Pollution Simulation and Human Performance. 15490-F

Air Pollution Situation in Los Angeles - An Aerometric Survey. 05875-J

Air Pollution in Six Major U.S. Cities as Measured by the Continuous Air Monitoring Program (CAMP). 01912-J

Air Pollution - A Special Report. 09094-B

Air Pollution From Solvents. 15352-B

Air Pollution Studies. 09200-M 03234-0

Air Pollution Studies with Simulated Atmospheres. 00177-C

Air Pollution Study of the Capitol Region. 04770-J

Air Pollution Study of New Britain, Connecticut (summary Report). 06966-J

Air Pollution Teheran. An Introductory Survey of the Problems and Some Suggested Activities. 09209-J

Air Pollution in Tokyo. 07198-J

Air Pollution in Westchester. 04833-J 76946-J

Air Pollution and the Obiquitous Auto. 08273-A

Air Pollution by Volatiles Liberated by Some Plastics. 11493-B

Air Pollution - Whose Problem? 01074-A

Air Quality. 11527-A

Air Quality in Boston, Massachusetts (November-December 1963). 02317-J

Air Quality in Clark County, Washington. 01960-J

Air Quality Control by Petroleum Refineries. 01168-B

Air Quality as a Controlling Factor in Life Processes. 12177-A

Air Quality Criteria Associated with Visibility Reduction. 07605-L

Air Quality Criteria for the Photochemical Oxidants. 04963-F

Air Quality Criteria and Standards for Agriculture. 00737-G

Air Quality Data - 1966. 05336-J

Air Quality Data from the National Air Sampling Networks and Contributing State and Local Networks, 1964-1965. 02340-J

Air Quality of Los Angeles County. 04616-J

Air Quality Survey, El Paso Metropolitan Areas. 16266-J

Air Resource Management Plan for the Nashville Metropolitan Area. 00847-J

Air Resource Management Program Southwestern Ohio-Northern Kentucky. 02376-K

Air Resource Management in the San Francisco Bay Area. 01211-A

Air Resources in the Mid-Willamette Valley. 08977-J

Air Sampling and Analysis with Microcolumns of Silica Gel. 01499-D

Air Sampling with Plastic Bags. 00620-D

Air and Water Pollution. 05598-K

Air and Water Pollution: Does It Limit Industrial Expansion? 07608-I

Air and Water Pollution Studies Related to Proposed Petroleum Refinery for Sand Island-OAHU, Territory of Hawaii. 03420-B

Alicyclic Compounds Containing Sulfur. 16599-H

Alkanes, Fatty Acid Methyl Esters, and Free Acids in Surface Wax of Ustilago maydis.

Altered Function in Animals Inhaling Conjugated Nitro-Olefins. 02285-F

Alternative Nonpolluting Power Sources. 12501-B

American Paint Convention; Air Pollution and Rule 66 Discussed. 08826-K

Ammonia Absorption: Refrigeration Selected for Gasoline Plant. 10427-E

Ammonia as a Diesel Engine Fuel; Theory and Application. 10044-B

Ammonia Fuel-Engine Compatibility and Combustion. 04008-B

Analysis of Air and Breath for Chlorinated Hydrocarbons by Infrared and Gas Chromatographic Techniques. 01310-D

Analysis of Air Near Heavy Traffic Arteries. 05113-B

Analysis of Airborne Pollutants. 08869-D

Analysis of Alpha Olefins Using a Gas Chromatograph-Mass Spectrometer Combination. 02204-H

Analysis for Aromatic Compounds on Paper and Thin-Layer Chromatograms by Spectro Photophosphorimetry, Application to Air Pollution. 00868-D

Analysis of the Atmosphere for Light Hydrocarbons. 01208-D

Analysis of Chlorinated Hydrocarbons with the Gas Chromatograph. 03732-D

Analysis of Combustion Products with Gas Chromatography Apparatus. 05328-D

Analysis and Comparison of Available Data on Air Quality Criteria in Member Countries. 07804-L

Analysis of Compounds Containing the p-Nitrosanilino Phosphor and Analogous Groups by Phosphorimetry and by Room-Temperature and Low Temperature Fluorimetry. 00146-D

Analysis for Exhaust Gas Hydrocarbons Nondispersive Infrared Versus Flame-Ionization. 02848-D

Analysis by Gas Chromatography of Phenolic and Aromatic Compounds Obtained From Thermal Cracking of Phenols. 11559-D

Analysis of the Interesting Components of Exhaust Gases. 11567-B

Analysis of Gaseous Air Contaminations by Infrared Spectroscopy. 14470-D

Analysis of Gaseous Mixtures Containing Carbon Monoxide, Carbon Dioxide, Hydrogen, Methane, Nitrogen, and Oxygen. 14430-D

Analysis of Hydrocarbon-Air Combustion Flames. 13560-H

Analysis of Instrument Down Time for a Large Air Monitoring Network. 07885-D

Analysis of Kraft-Mill, Sulfur-Containing Gases with GLC Ionization. 01784-D

Analysis of Small Gas Samples by Means of Gas Chromatography. 11558-D

Analysis of the Spacecraft Atmosphere. 08624-D

Analysis of Trace Contaminants in Closed Ecologic Atmospheres. 09766-J

Analysis of the Urban Atmosphere and Air Pollution Source Effluents for Phenalen-1-one and 7H-Benz(de)-anthracen-7-one. 01795-D

Analytical Control of Contaminant Concentration in Exposure Chambers. 03813-F

Analytical Investigation of Some Types of Soot, Using Mass Spectrometry. 13806-D

Analytical Procedures for the Environmental Health Laboratory. 08333-D

Analytical Study of Contaminant and Atmospheric Sensor. 15294-H

Analytical System for Identifying the Volatile Pyrolysis Products of Plastics. 08294-D

Analytical Techniques for Identification of Gas-off Products from Cabin Materials. 03828-D

Analyzing Air Pollutant Concentration and Dosage Data. 00321-J

Analyzing Amine Traces in Atmospheric Air. 03969-D

Anatomical Effects of Air Pollution on Plants. 04999-A

Animal Exposure Chambers in Air Pollution Studies. 00142-D

Annoyance Caused by Odorous Exhaust Gases. 15298-B

1965 Annual Report - Department of Air Pollution Control - City of New York. 00169-F

Apparatus for the Analysis of Combustion Products Obtained During the Oxidation of Hydrocarbons. 04667-D

Apparatus for Cleaning the Exhaust Gas of an Internal Combustion Engine. 15184-E

Apparatus for the Determination of Carbon Monoxide and Carbon Dioxide in the Air and of Gaseous Components of Liquid Fuel. 07150-D

Apparatus for Purifying Air. 13784-E

Apparent Rate Constants and Activation Energies for the Photochemical Decomposition of Various Olefins. 01264-C

Applicability of Organic Liquids in the Development of New Processes for Removing Sulfur Dioxide from Flue Gases. 12803-E

Application of Cell Culture as a Primary Toxicity Screen of Possible Spacecraft Contaminants. 07972-F

Application of Continuous Infrared Instruments to the Analysis of Exhaust Gas. 07627-D

Application of Controlled Partial Gas Phase Thermolytic Dissociation to the Identification of Gas Chromatographic Effluents. 05404-D

Application of the Copper Oxide-Alumina Catalyst for Air Pollution Control. 08207-E

Application of Diffusion Cells to the Production of Known Concentrations of Gaseous Hydrocarbons. 03089-D

Application of Gas Chromatographic Methods for Air Pollution Studies. 05863-D

Application of Gas Chromatography to Analysis of Exhaust Gas. 07828-D

Application of Gas Chromatography to the Analysis of Solvent Vapours in the Industrial Air. 07335-D

Application of Gas-Liquid Chromatography for Determination of Trace Hydrocarbons in Air and Compressed Breathing Gases. 05056-D

Application of Hot Wire Ionization Detector to Automotive Exhaust Gas Analysis. 04839-D

Application of ITLC and Fluorometry to the Estimation of 7H-Benz(de) anthracen-7-one and Phenalen-1-one in Organic Extracts of Airborne Particulates From 3-Hour Sequential Air Samples. 11218-D

Application of the 3-Methyl-2-Benzothiazolone Hydrazone Method for Atmospheric Analysis of Aliphatic Aldehydes. 02008-D

Application of Reactivity Concepts to Emissions from Device Equipped and Unequipped Automobiles. 07807-D

Apparatus for Purifying Air. 13704-E

Apparent Rate Constants and Activation Energies for the Photochemical Decomposition of Various Olefins. 01764-C

Applicability of Organic Liquids to the Development of New Processes for Removing Sulfur Dioxide from Flue Gases. 12503-E

Application of Cell Culture as a Primary Toxicity Screen of Possible Spacecraft Contaminants. 07072-F

Application of Continuous Infrared Instruments to the Analysis of Exhaust Gas. 07627-D

Application of Controlled Partial Gas Phase Thermolytic Dissociation to the Identification of Gas Chromatographic Effluents. 05404-D

Application of the Copper Oxide-Alumina Catalyst for Air Pollution Control. 08207-E

Application of Diffusion Cells to the Production of Known Concentrations of Gaseous Hydrocarbons. 03059-D

Application of Gas Chromatographic Methods for Air Pollution Studies. 05863-D

Application of Gas Chromatography to Analysis of Exhaust Gas. 07628-D

Application of Gas Chromatography to the Analysis of Solvent Vapours in the Industrial Air. 07535-D

Application of Gas-Liquid Chromatography for Determination of Trace Hydrocarbons in Air and Compressed Breathing Gases. 05056-D

Application of Hot Wire Ionization Detector to Automotive Exhaust Gas Analysis. 04839-D

Application of ITLC and Fluorometry to the Estimation of 7H-Benz(de) Anthracen-7-one and Phenalen-1-one in Organic Extracts of Airborne Particulates From 3-Hour Sequential Air Samples. 11218-D

Application of the 3-Methyl-2-Benzothiazolone Hydrazone Method for Atmospheric Analysis of Aliphatic Aldehydes. 02096-D

Application of Reactivity Concepts to Emissions from Device Equipped and Unequipped Automobiles. 07807-D

Application of Research to Motor Vehicle Emission Control--Can we Avoid Afterburners? 05633-D

Application of Silica Gel in Source Testing. Part I. Collection of Samples. 01333-D

Application of Subtractive Techniques to the Analysis of Automotive Exhaust. 00132-D

Application of Thin-Layer Chromatographic and Spectral Procedures to the Analysis for Azo Heterocyclic Hydrocarbons in Complex Mixtures. 00869-M

Application of Thin Layer Chromatography to the Analysis of Atmospheric Pollutants and Determination of Benzo(a)pyrene. 0.736-D

Application of Thin-Layer Chromatography to the Analysis of Atmospheric Pollutants. Simplified Analysis for Benzo(a)pyrene. 02795-J

Application of Trichloroacetic Acid Level in Urine as a Measure of Trichloroethylene Vapor Exposure. 09316-F

Appraisal of Air Pollution in Minnesota. 03409-J

Approach to the Characterization of the Airborne Organic Matter (Benzene Soluble) in the Atmosphere of

[illegible] (Eng. 1983-).

[illegible] Question of an [illegible] Law for Pollution Problems. 00339-J

[illegible] Hydrocarbons in Nuclear [illegible] Atmospheres. 11481-D

[illegible] Hydrocarbons, [illegible] Presence in the Air and Vegetal Atmosphere and the Carcinogenicity of [illegible] Extracts. 11029-F

[illegible] Hydrocarbons Produced During Combustion of Single Aliphatic Fuels. 11002-D

[illegible] Polycyclic Hydrocarbons Found in the Exhaust Gases of Engines Run on Gasoline and [illegible] Petroleum Gas. 11552-D

[illegible] Polycyclic Hydrocarbon in Pollution Air as Indicators of Carcinogenic Hazards. 05109-B

[illegible] of Industrial Contamination. 00823-A

Assessing the Major Hazards of Gaseous Air Pollutants. 02969-F

Assessment of Factors Concerning Wild Carcinogenic Properties of Air Pollutants. 03750-F

Asymmetric Electronic Transitions and Photochemistry. 03822-M

Atlantic Richfield Vehicle Vapor Recovery System. 04892-D

Atmosphere and Pollutants. 09764-M

Atmospheric Air Pollution with Discharges from Synthetic Fatty Acids and Alcohols Producting Industries and Their Effect on the Health of the Population. 11426-F

Atmospheric Air Pollution in Poland. 10320-K

[illegible] Analysis by Gas Chromatography. 08813-J

[illegible] Benzopyrene. 03193-J

[illegible] Contaminants and Cancers. Issue Report. 02712-L

[illegible] Contamination in Gases. 00829-J

[illegible] Control Systems for Paint Emissions. 06294-G

[illegible] Determination of Airborne Polycyclic Hydrocarbons, Especially the Determination of 3,4-Benzpyrene. 11376-D

[illegible] Emissions from Synthetic Rubber Manufacturing Processes. 11742-D

[illegible] Emissions from Open Burning. 11436-D

[illegible] Factors in Carcinogenesis of Lung Cancer. 01809-F

Atmospheric Hydrocarbon and Carbon Monoxide Measurements at Point Barrow, Alaska. 13060-J

Atmospheric Photochemical Reactions of Halogens of BaO_2 Salts. 06813-A

Atmospheric Photooxidation of the Cyclohexane-Nitric Oxide System. 03001-M

Atmospheric Photooxidation of Olefins: The Effect of Nitrogen Oxides. 03429-M

Atmospheric Photooxidation of trans-Butene-2 and Nitric Oxide. 03837-M

Atmospheric Pollutants and their Analysis (Special Report Smog 2). 02415-D

Atmospheric Pollution in the Area of Pesticide Storehouses. 03931-J

Atmospheric Pollution with 3,4-

Benzpyrene in the Vicinity of a Coal Briquet Factory. 07570-B

Atmospheric Pollution by 3,4-Benzpyrene in the Vicinity of a Timber-Chemical Plant. 10631-A

Atmospheric Pollution by Discharge from Chemical Plants. 04258-G

Atmospheric Pollution as a Factor in the Aging of Elastomers. 08476-H

Atmospheric Pollution in Latin America. 04052-A

Atmospheric Pollution and Lung Cancer. 00839-F

Atmospheric Pollution by Petroleum Refineries and Petrochemical Plants. 04869-F

Atmospheric Pollution, the Problem - An Overall View. 01992-F

Atmospheric Reaction Studies Related to Air Pollution. 00302-C

Atmospheric Survey of Chilliwack, British Columbia. 00802-J

Atmospheric Thermal Oxidation in Nitric Oxide. 02838-A

Attempts to Prevent the Formation of Pollutants in the Exhaust Gases of Two-Stroke Engines and Diesel Engines by Activating Combustion Within the Engine. 02648-E

Auto-Exhaust Proportional Sampler. 02378-D

Auto Standards Will Tighten. 04417-E

Automated Line for the Production of Extruded Air Rotors. 15469-E

Automatic Air Monitoring and Telemetering to Central Points in Allegheny County. 09370-E

Automobile and Air Pollution; A Program for Progress. 07593-B

Automobile Emission and Motor Oils. 14193-E

Automobile Exhaust Gas Treatment - An Industry Report. 07037-B

Automobile Exhaust Hydrocarbon Analysis by Gas Chromatography. 03877-D

Automotive Air Pollution. 04315-B

Automotive Air Pollution (A Report of the Secretary of Health, Education, and Welfare to the U.S. Congress Pursuant to Public Law 88-206, The Clean Air Act) 00152-K

Automotive Air Pollution. (Second Report of the Secretary of Health, Education, and Welfare, to the U.S. Congress, Pursuant to Public Law 88-206 The Clean Air Act.) 01863-B

Automotive Air Pollution. (Third Report of the Secretary of Health, Education, and Welfare, to the U.S. Congress Pursuant to Public Law 88-206 The Clean Air Act.) 01868-B

Automotive Air Pollution III. (A Report to the U.S. Congress in Compliance with Public Law 88-206, The Clean Air Act.) 03838-E

Automotive Air Pollution - Sixth Report of the Secretary of Health, Education, and Welfare to the Congress of the United States in Compliance with Public Law 88-206. 07805-K

Automotive Air Pollution; A Systems Approach. 07813-E

Automotive Contribution to Airborne Polynuclear Aromatic Hydrocarbons in Detroit. 04938-J

Auto Emissions After Hot and Cold Starts in Summer and Winter. 00271-B

Automotive Exhaust Problem (Its Relation to Health). 01988-F

Automotive Exhaust Study Conducted at U.S. Bureau of Mines Petroleum Research Center, Bartlesville, Oklahoma (Final Rept. July 7-Nov. 10, 1959). 02806-B

Automotive Mass Emission Analysis by a Variable Dilution Technique. 05536-D

Availability and Evaluation of Nonphotochemically Reactive Primers and Topcoats for Aerospace Applications. 00557-B

Azulene Procedure for Chromatographic Analysis of Aromatic and Heterocyclic Aldehydes, Carbohydrates, and Other Aldehyde Precursors. 07078-D

Basic Mechanisms of Photochemical Aerosol Formation. 05632-E

Basic Study of Air Pollution Control Wet Scrubbers. 03339-E

Bench Scale Reaction System for Measuring Atmospheric Smog Potential. 07806-A

Bench-Scale Research in CSG Process, Laboratory Physico-Chemical Studies, Phase II. 15524-A

Benzene and its Homologues as Poisons in Electrical Winding and Insulation Plants. 00665-F

Benzene; Toluene and Xylene; Styrene (Methods for the Detection of Toxic Substances in Air). 04219-D

Benzo(a)pyrene Content of the Air of American Communities. 05226-J

Benzo(a)pyrene Content of Dust Samples From the Metropolitan Area of Vienna. 15248-J

Benzo(3-4)pyrene in the Dust Sediment of Zurich, Baden, and Klotemer Ried. 16336-J

Benzo(a)pyrene in Gasoline Particularly Persists in Automobile Exhaust. 10734-B

Benzo(a)pyrene in an Iron and Steel Works. 11015-J

Benzo(a)pyrene and Other Aromatic Hydrocarbons Extractable From Bituminous Coal. 01395-D

Benzo(a)pyrene Production During Controlled Combustion. 05606-D

3,4-Benzpyrene in Crude Oil and in Bituminous Products. 04108-E

Benzpyrene and Other Polycyclic Hydrocarbons in the Air of Copenhagen. 03686-F

Biological Assay Method for Mixtures of Hydrocarbons Using Human Cells in Tissue Culture. 02373-E

Biological Effects of Atmospheres Contaminated by Auto Exhaust. 00475-F

Biological Effects of Atmospheric Pollutants and Hygienic Standards for Atmospheric Pollutants Outside the U.S.S.R. 11480-F

Biological Effects of Urban Air Pollution. 10456-F

Biological Effects of Urban Air Pollution. Effects of Acute Smog Episodes on Respiration of Guinea Pigs. 02277-F

Biological Effects of Urban Air Pollution. II. Chronic Exposure of Guinea Pigs. 00779-F

Biological Effects of Urban Air Pollution. III. Lung Tumors in Mice. 00639-F

Biological Interaction Between Plasticizers and Insecticides, 16356-F

Biosynthesis of Galactolipids in Plants, 07446-G

Bi-State Study of Air Pollution in the Chicago Metropolitan Area 03461-J

Bladder Tumors in a Coal Tar Dye Plant, 01038-B

Blastomogenic Properties of Crude Oils From Different Oil Fields, 04109-F

Blastomogenic Substances in the Human Environment and Some Mechanisms Governing Origination of Cancer, 14422-F

Brief Survey of the Literature Relating to Exhaust Gas Control by Means of Engine Modification, 02637-E

Bromocoulometric Olefin Analysis, 12032-D

Bronchial Carcinoma, Air Pollution, Smoking, and Lung Cancer, 06003-F

Burning Device Eliminates Air Pollution in the Disposal of Waste Aluminum Alkyls, 12159-B

Calibration of Automatic Analyzers in a Continuous Air Monitoring Program, 02354-D

Calibration of Coulter Counters for Particles About 1 Micron in Diameter, 08083-D

Calibration Particulate Air Samplers With Monodisperse Aerosols; Application to the Andersen Cascade Impactor, 02323-D

Calibration Studies of a New Sub-Micron Aerosol Size Classifier, 09850-D

Calculating Air Quality and its Control, 00739-J

California Motor Vehicle Emission Standards, 07625-B

California's Program for Motor Vehicle Emission Control, 02055-K

California Standards for Ambient Air Quality and Motor Vehicle Exhaust, 03007-L 03582-L 03583-L 03586-L

Can Municipal Incinerators Meet Tomorrow's Regulations? 00288-B

Cancer and Atmospheric Pollution, 0.020-F

Cancerogenic Substances in the Air of Cities and Possible Preventive Measures, 00835-B

Cancers in Mice From Asphalt Fractions, 02276-F

Capillary Gas Chromatographic Method For Determining the C_5-C_{12} Hydrocarbons in Full-Range Motor Gasolines, 09574-D

Carbon Formation From Aromatic Hydrocarbons II, 03986-H

Carbon Tetrachloride Poisoning, 08295-F

Carburetor Evaporation Losses, 07632-B

Carcinogenesis in AKR Mice Injected at Birth with Benzo(a)pyrene and Dimethylnitrosamine, 07785-F

Carcinogenic Appraisal Study, 03643-F

Carcinogenic Aromatic Hydrocarbons in Automobile Effluents, 01861-E

Carcinogenic Chemical Substances in the Environment, 04708-F

Carcinogenic Effect of Shale Fuel Soot on White Mice, 08210-F

Carcinogenic Effects of Single and Repeated doses of 3,4-Benzpyrene, 05298-F

Carcinogenic Hydrocarbons in the Atmosphere of Osaka City, 02061-J

Carcinogenic Hydrocarbons (Effects on Suckling Rat Trachea in Organ Culture), 00864-F

Carcinogenic Hydrocarbons in the Smoke From Charcoal Grilling,

Carcinogenic Properties of Coke Oven Wastes, 02673-B

Carcinogenic Properties of Exhaust Gas Soot of Motor Transport, 05231-F

Carcinogenic Substances in Water and Soil, XVIII. The Determination of Polycyclic Aromatic Hydrocarbons Using Combined Thin-Layer Chromatography and Fluorescence Measurement, 00589-D

Carcinogenicity of Organic Extracts of Atmospheric Pollutants, 05383-F

Carcinogenicity of Polluted Air, I. Analysis of Exhaust Gas From a Combustion Engine, 09405-B

Carcinogens in a Cracked Petroleum Residuum. The Contributions of Various Polycyclic Aromatic Hydrocarbons to the Carcinogenic Potency of a Catalytically Cracked Oil, 01453-B

Case for Clean Air (Special Report), 08146-A

Catalyst for the Reaction Between Hydrocarbons and Sulfur Dioxide for the Preparation of Pure Sulfur, 13391-H

Catalyst Regeneration, 09038-B

Catalyst System Morphology and Design, 14333-E

Catalytic Combustion and Adsorption Kinetics of Carbon Monoxide on Cupric Oxide, 01497-E

Catalytic Combustion of Atmospheric Contaminant Over Hopcalite, 03969-H

Catalytic Combustion of Atmospheric Contaminant in Space Vehicle Atmospheres, 04970-E

Catalytic Combustion of C1 to C5 Hydrocarbons, 01241-H

Catalytic Combustion of Cyclohexane, Cyclohexene, and Benzene (Chemical and Transport Kinetics), 04617-H

Catalytic Combustion of Hydrocarbons with Copper Oxide, I, 05250-E

Catalytic Combustion of Hydrocarbons with Copper Oxide, II, Cyclic Compounds, 05147-E

Catalytic Combustion of Hydrocarbons, IV, Effect of Preparation Method on Catalytic Activity, 00101-H

Catalytic Decomposition of Nitrogen Dioxide, 00097-E

Catalytic Muffler, 13036-E

Catalytic Oxidation of Hydrocarbons (an Approach to Air Pollution Control), 03706-E

Catalytic Oxidation of Hydrocarbons (Tests of Single Oxides and Supported Catalysts in a Microcatalytic Reactor), 03797-E

Catalytic Oxidation of Methane at Low Space Velocities, 00612-E

Catalytic Oxidation of Odorous Ink Solvent Vapors, 05929-E

Catalytic Systems for Leaded and Unleaded Gasoline Exhausts, 14604-E

Central Nervous System and the Pharmaco-Dynamics of Some Vapor Forming Substances Inhaled With the Air, 07316-F

Certification of Automotive Exhaust Emission Laboratories by Cross Checks of the Analytical Instruments, 04319-D

Change Your Process to Alleviate Your Pollution Problem. 06170-E

Changes in Transpiration and Photosynthetic Rates of Various Leaves During Treatment with Ozonated Hexane of Ozone Gas. 05777-G

Characteristics of the Expansion of Reactive Gas Mixtures as Occurring in Internal Combustion Engine Cycles. 01376-B

Characteristics and Photochemical Reactivity of Vehicular Emissions. 06300-B

Characterization of Aromatic Compounds by Low-Temperature Fluorescence and Phosphorescence; Application to Air Pollution Studies. 00440-D

Characterization of Carbazole and Polynuclear Carbazoles in Urban Air and in Air Polluted by Coal Tar Pitch Fumes by Thin-Layer Chromatography and Spectrophotofluorometry. 00230-D

Characterization and Estimation of N-Alkanes in Airborne Particulates. 01471-J

Characterization of Physical, Chemical and Biological Properties of Fucus in the Intact Animal. 03839-F

Characterization of Polynuclear Azo Heterocyclic Hydrocarbons Separated by Column and Thin-Layer Chromatography From Air Pollution Source Particulates. 00624-D

Charcoal Sampling Tubes for Organic Vapor Analysis by Gas Chromatography. 01302-D

Charge-Transfer Complex Between Sulfur Dioxide and Trimethylamine in the Gas Phase and in Heptane. 16816-H

Chemical Additives in Petroleum Fuels: Some Uses and Action Mechanisms. 05300-E

Chemical Analyses of Automobile Exhaust Gases for Oxygenates. 00484-B

Chemical Analysis of Permanent and Organic Gases in A 50-Day Manned Experiment. 00547-J

Chemical Aspects of Environmental Health. 08079-D

Chemical Aspects of the Photooxidation of the Propylene-Nitrogen Oxide System. 01858-C

Chemical Carcinogens, Carcinogenesis and Carcinostasis. 05480-P

Chemical Constitution and Reactions of Coal. 15304-H

Chemical Methodology in Auto Exhaust Studies. 04796-D

Chemical Mutagens in the Human Environment 15886-P

Chemical Nature of the Particulate in Irradiated Automobile Exhaust. 05849-H

Chemical and Physical Characterization of Polluted Environments, Inhaled or Ingested, and of Acoustical Influences . 02538-D

Chemical Process 02234-B

Chemical Reactions in Los Angeles Smog. 04088-C

Chemical Studies of Asbestos. 01467-H

Chemical Supplement in Air Pollution Control Programs. 07071-B

Chemically Induced Methemoglobinemia in the Mouse. 04725-P

Chemicals as Causes of Cancer. 01003-P

Chemiluminescence of Hydrocarbon Oxidation. 00420-D

Chemiluminescence Method for Determining Ozone. 02168-D

Chemistry of Atmospheric Oxidants. 11010-N

Chemistry of Town Air. 04407-A

Chemistry of Urban Atmospheres. 05176-P

Chemo-Electrical Sensing Device 00091-D

Chemotherapy for Oxidant and Ozone Induced Plant Damage. 05775-G

Chilltech Respiratory Survey, 1965: Part II, Aerometric Study. 05052-J

Chlorine Photosensitized Oxidation of Hydrocarbons at Low Temperature. 04218-N

Chromatographic Location and Colorimetric Determination of Nervegases. 04029-D

Chromatographic Separation of Benzene and Isopropylbenzene and of Benzene and Chlorobenzyl in Air Analysis. 07155-D

Chromatographic Separation of Polycyclic Aromatic Hydrocarbons. A Method for Concentration and Preliminary Purification of Extracts From Samples of Atmospheric Dust. 05588-D

Chromatographic Separation and Spectral Analysis of Polynuclear Aromatic Amines and Heterocyclic Imines. 00020-P

Chromatography of the Light Gases on Metal-Substituted Silica Gels. 14048-N

Chromium Catalysts for Oxidizing Automotive Exhaust. 02757-E

Chronic Effect of Certain Components of Exhaust Gases From Motor Cars. 04283-P

Chronic Inhalation Toxicity of Chlorobromomethane. 00857-P

Clean Air Act Amendments and Solid Waste Disposal Act of 1965 (P.L. 89-272). 00125-B

Clean Air for California (Initial Report of the Air Pollution Study Project, California State Dept. of Public Health). 05541-J

Clean Air and the Diesel. 14297-E

Clean Air for Good Citrus. 05511-G

Clean Air Maintenance:A Task for the Office of Public Health. 07235-E

Clean Fuel Power Cycles. 00488-B

Cleaner Air and the Gas Industry (Part I). 05746-B

Cleaner Air for North Carolina (A Survey and Appraisal for Air Pollution Problems.) 05438-A

Cleaning of Industrial Gases With Precious Metals Catalysts. 15271-E

Cleavage of 10-Substituted 1,2-Benzanthracenes. 01628-N

Collection and Analysis of Odorous Gases From Kraft Pulp Mills. Part II: A Laboratory Study of the Collection of Pollutants for Analysis. 08156-D

Collection and Analysis of Odorous Gases From Kraft Pulp Mills. Part IV:

The Analysis of Collected Pollutants by Gas Chromatography. 08557-D

Collection of Trichloroethylene and Perchloroethylene Vapors. 06221-B

Colorimetric Determination of Alcohol Vapor in Air. 02044-D

Colorimetric Determination of Small Quantities of Styrene in the Air. 08158-D

Colorimetric Determination of Vinyl Chloride in the Air. 02135-D

Colorimetric Method for the Determination of Hexachlorophydiphenyl in the Air. 04059-D

Colorimetric Method for Total Alkyl Amines Determination. 04068-D

Colorimetric and Spectrophotometric Determination of Phenylurethylene in Factory Air. 04245-C

Column Chromatographic Separation of Basic Polynuclear Aromatic Compounds From Complex Mixtures. 01817-D

Column Chromatography and Spectroscopy in the Analysis of Airborne Polycyclics. 07435-D

Column and Thin-Layer Chromatographic Separation of Polynuclear Ring Carbonyl Compounds. 00934-D

Combined Effect of Acetone and Acetophenone in the Atmosphere. 07579-F

Combustion of Domestic Refuse Containing a High Proportion of Synthetic Materials. 15657-H

Combustion Gas Sampling Valve. 04778-D

Combustion of Liquid and Gaseous Fuels in a Fluidized Bed of Fine-Grain Material and Utilization of Heat From the Exhaust Gases. 14388-H

Combustion Studies of Olefins and of Their Influence on Hydrocarbon Combustion Processes. 13058-H

Combustion System for a Vehicular Regenerative Gas Turbine Featuring Low Air Pollutant Emissions. 09320-H

Combustion Trimgis for Flue Gases From Compound Furnaces. 04557-H

Commission on Earth, Water and Air, Rotterdam. 14534-J 14616-J

Committee on Air Pollution: Report. 00757-H

Community Air Quality Guides. 13028-L

Community Air Quality Guides, Ethylene. 15715-L

Community Hazards of Asbestos. 10741-F

Comparative Pathology of Animals Exposed to Carbon Tetrachloride at Ambient Air Vs. 5 PSIA 100% Oxygen Atmosphere. 08028-F

Comparative Procedure for Evaluating Antimicrobial Activity of Gaseous Agents. 05204-F

Comparative Studies of 90-Da/Continuous Exposure to O_3, NO_2 and CCl_4 at Reduced and Ambient Pressures. 11159-F

Comparative Study of the Adsorption of Gases on Charcoal in Solution. 13686-H

Comparative Study of Atmospheric Air Pollution Near Various Point Sources Utilizing Dichloromethane as Tracer and Organic. 07085-D

Comparative Study of Various Methods for the Separation of Formaldehyde. 03004-D

Comparative Toxicity Studies of Selected Compounds for Tolerance to Ozone in Rats in Air, Ozone Plus an Ambient Air Mix, and Ozone Plus Inert Oxygen Atmosphere. 00024-D

Comparative Toxicity Studies of Benzene, Toluene, and Xylene by the Buffalo Activated Method. 12196-D

Comparative Toxicity Studies on Benzene and Aniline Precursors. 01208-D

Comparative Yields of Soot from Premixed Hydrocarbon Flames. 07106-D

Comparison of Auto Exhaust Emissions in Two Major Cities. 01013-D

Comparison of Automotive Emissions in Cities at Low and High Altitudes. 01007-D

Comparison Between the Hydrocarbons in Automobile Exhaust and Those Found in the Los Angeles Atmosphere. 05091-D

Comparison of the Effects of the Concentrations of Benzene, Toluene and Xylene. 07075-D

Comparison of Fifty-Two Spectrophotometric Methods for the Determination of Nitrite. 01001-D

Comparison of Fluorimetric Methods of Assay for Benzo(a)pyrene in Particulates from Urban Atmosphere and Air Pollution Source Effluents. 00224-D

Comparison of Three Methods for Trace Analysis of Polycyclics. 00044-D

Comparison of Air Pollutant Emission Factors for Combustion Processes, Gasoline Evaporation, and Selected Industrial Processes. 00072-D

Complex Formation, Isolation, and Carcinogenicity of Polycyclic Aromatic Hydrocarbons. 05084-D

Complicating Factors in the Gas Phase Photolysis of Acetaldehyde. 03059-D

Complying With Solvent Control Legislation. 00050-D

Composition of Automobile Blowby Gases. 01204-D

Composition of Bloody Emissions, 07375-B

Composition of Diesel Exhaust Hydrocarbons, 14580-B

Composition of Exhaust Gases From Diesel Motors, 08802-B

Composition of Exhaust Gases From Diesel, Gasoline and Propane Powered Motor Coaches, 05850-B

Composition and Nature of Bloody and Exhaust Gases From Passenger Car Engines, 04993-B

Composition and Odor of Diesel Exhaust, 07351-J

Composition and Reactions of Pollutants in Community Atmospheres, 14010-C

Comprehensive Analyses of Automotive Exhausts, 01381-B

Computer Analysis of the California Cycle, 00277-D

Concentration and Distribution of Irritants in Polluted Atmospheres, 00490-P

Concentration of Hydrocarbon on Silica Gel Prior to Gas Chromatographic Analysis, 02157-D

Concentration of Isotopes by the Evaporative Centrifuge Method, 15063-M

Concentrations of Hydrocarbons in the Air Over Urban Streets and Their Relation to the Occurrence of Carbon Monoxide, 05512-J

Conditioned Polyethylene as a Permselective Membrane, 15186-M

Conditions of Safe Oxidation of Tolerance by Atmospheric Oxygen, 07518-C

Consideration of Emission Standards for Exhaust Hydrocarbons in Terms of Quantity, 06350-B

Considerations of the Possibility of Control of Oxides of Nitrogen, 15041-B

Constituents of City Smoke, 06135-D

Constitution of Aerosolicidal Particulates Above the Ocean Surface, 06186-J

Contamination of Air by 3,4-Benzopyrene Around Certain Industrial Enterprises, 05886-J

Contamination of the Air of a Large City With Carcinogenic Agents, 07587-J

Contamination Generation of Internal Combustion Engines, 01347-B

Contamination of Urban Air Through the Use of Insecticides, 00188-B

Contaminant Concentrations in the Atmosphere of Los Angeles County, 05110-J

Containment Studies in Closed Biological Systems at the School of Aerospace Medicine, 08025-B

Contaminants in Flue Gases, 01362-B

Contaminants Standards, 11241-F

Continuous Air Monitoring Program in Cincinnati, 1957-1961, 00029-C

Continuous Air Monitoring Program in Washington, D. C. (1962-1963) 01871-D

Continuous Automatic Determination of Sulfur Dioxide in the Presence of Auto Engine Exhaust. 04825-D

Continuous Control of Air Pollution With Industrial Analysers. 00834-D

Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyser. 07504-D

Continuous Gas Mixing by the Use of Critical Flow Through Small Diameter Tubes. 00076-H

Continuous Measurement of Hydrogen, Methane, and Hydrocarbons in the Atmosphere. 15200-D

Continuous Monitoring of Ambient Atmospheres With the Technicon Auto-analyser. 00977-D

Continuous Monitoring of Diesel Exhaust Gas For Carbon Dioxide, Carbon Monoxide, Oxygen, Methane, and Nitrogen Oxides. 15484-D

Continuous Monitoring of Methane and Other Hydrocarbons in Urban Areas. 01828-C

Continuous Sampling of Automobile Exhaust Gas and Adjustment of Standard Gases. 15909-D

Continuous Selective Monitoring of Hydrocarbons: Application to Determination of Methane. 00823-D

Continuous Trace Hydrocarbon Analysis by Flame Ionization. 01869-D

Construction of Burning of Agricultural Wastes to Photochemical Air Pollution. 01076-H

Control of Air Pollution. 01845-H

Control of Air Pollution From Motor Vehicles and New Motor Vehicle Engines-Proposed Rules. 00556-H

Control of Air Pollution Originating From Federal Installations and Standards by the Secretary of Health, Education, and Welfare Implementing the Objectives Prescribed by Executive Order 11282. 00306-H

Control of Air Pollution Due to Petrol Engines. 10484-H

Control of Air Pollution and Waste Heat Recovery From Incineration. 02153-H

Control of Automobile Emissions. Ford Crankcase Emissions Control System. Ford Thermactor System for Exhaust Control. 00171-H

Control of Environment: Economic and Technological Prospects. 00526-J

Control of Nitrogen Oxides in Automotive Exhaust. 04809-H

Control of Organic Solvent Emissions in Industry. 11031-H

Control of Photochemical Smog by Alteration of Initial Reactant. 01804-C

Control of Solvent Emissions. 08345-H

Control of Stationary Sources. 00107-H

Control of Toxic and Explosive Hazards in Buildings

Erected on Landfills. 04419-B

Control of Vapors From Bulk Gasoline Loading. 05859-B

Controlled Addition of Experimental Pollutants to Air. 10877-D

Controlled Rate-Exothermic Oxidation of Industrial Wastes. 04838-B

Conversion of Fossil Fuel to Liquid Fuels. 08301-B

Conversion of Fossil Fuels to Utility Gas. 08300-B

Conversion of Sulfur-Containing Hydrocarbons. 14104-H

Cooperative Research Program for Automotive Emission Control. 14036-H

Coke Ovens. 09803-B

Correlation Between 3,4-Benzpyrene and Carbon Monoxide Concentrations in Automobile Exhaust Gases. 04008-B

Correlation of the Blackness Index of Hi-Vol Air Samples With the Polycyclic Hydrocarbon Concentrations. 10668-D

Correlation of Exhaust Emission Test Facilities. 09348-D

Correlation of Piperonal Test Values for Aromatic Compounds With the Atmospheric Concentration of Benzo(a)pyrene. 01720-D

Cost Estimates of Processes for Separating Mixtures of Methane and Hydrogen. 15078-H

Costs and Economic Impacts of Air Pollution Control Fiscal Years 1970-1974. 10174-I

Counteracting Offensive Odors Caused by Organic Compounds. 14004-B

Crankcase Gas Causes 40% of Auto Air Pollution. 01804-B

Criteria for Air Quality and Methods of Measurement. 00948-J

Criteria for Certification of Motor Vehicle Pollution Control Devices in California. 08743-B

Criteria and Methods for Establishing Maximum Permissible Concentrations of Air Pollution. 01016-P

Critical Comparison of Low-Emission Otto and Rankin Engine for Automotive Use. 14202-B

Critical Solution Temperatures of Systems of Sulfur Dioxide and Normal Paraffins. 16043-H

Cryogenically Trapped Trace Contaminants Analyzed by Ionizing Gas Chromatography. 09754-D

Cryogenics in Gas Processing. 15081-H

Current Status and Future Prospects. 08071-A

Cyclic Sulfones Derived From Butadienes. 16026-H

Cyto-Pathological Study of Potentially Carcinogenic Properties of Air Pollutants. 03678-F

Damage to Vegetation From Polluted Atmospheres. 03613-G

Dangers of the Metropolitan City Air. 10710-F

Data Acquisition Systems in Air Quality, 00725-A

Data for Determination of the Permissible Concentration of Chloroprene in the Atmospheric Air, 02802-J

Decreasing the Concentration of Toxic Exhausts From Automobile Engines, 10020-B

Defining the Problem of Air Pollution in Metropolitan Birmingham, Alabama, 07448-J

Definition of the Problem and Significance of Air Pollution From Petrol-Engined Vehicles (Part I of Atmospheric Pollution; A Survey of Some Aspects of the Emissions From Petrol-Engined Vehicles and Their Treatment), 07815-B

Degradation of 2,4-D in Forest Litter, 07088-H

Degree of Air Pollution in Norwegian Towns, 03685-J

Degree of Danger Caused by the Influence of Aromatic Polynuclear Hydrocarbons During the Manufacturing Process of Carbon Black, I; The Danger of Anthracene and the Determination of the Anthracene Content of the Air, 08521-D

Deodorization of Exhaust Gas I: Kraft Pulping (Part I) On the Formation of Nitrogenous Components in Kraft Pulping, 10404-B

Deposition of Coal and Pitch Dust on and Around Coke Ovens, 10125-B

Deposition of Radioactive Methyl Iodide to Vegetation, 03761-G

Depression of Ruming Activity in Mice by Exposure to Polluted Air, 11307-P

Design Consideration in Solvent Recovery, 08355-B

Design Considerations of a Photochemical - Atmosphere Environmental Test Facility, 03401-A

Design and Development of the Air Pump for the General Motors Air Injection Reactor System, 01119-B 04220-B

Design of a Method of Sampling and Measuring Heavy Hydrocarbon Concentrations in Combustion Fumes, 15277-D

Design of a Non-Dispersive Ultraviolet Gas Analyser and Its Application to Quantitative Measurement of Traces of Toxic Gases and Vapors in Air, 02886-D

Designing a "Clean Room" for Plastic Processing, 04130-B

Destruction of Benzo(a)pyrene by Soil Bacteria, 07150-H

Desulfurization of Liquid Hydrocarbon Fuel for Fuel Cells, 08479-B

Desulfurization as Method of Identifying Sulfur Compounds, 13770-D

Detailed Study of Contaminant Production in a Space Cabin Simulator at 760 mm. Hg, 07977-B

Detailed Study of Contaminants Produced by Man in a Space Cabin Simulator at 760 mm. Hg, 08851-B

Detection of 3,4-Benzpyrene in Some Species of Smoked Fish, 07280-D

Detection and Colorimetric Determination of Polycyclic Aromatic Compounds, 01907-D

Detection and Determination of Polycyclic Hydrocarbons in Urban Airborne Particulates. I. The Benzpyrene Fraction, 01707-D

Detection of 1,1-Dimethylhydrazine by Frustrated Multiple Internal Reflection Spectroscopy, 01451-D

Detection and Estimation of Part Per Billion Concentrations of Hydrocarbons, 05291-D 05541-D

Detection of Fluorine on the Nanogram Scale: Inorganic and Organic Fluorine Compounds, 15755-D

Detection and Lifetime of HNO3-Acetone in the Photolysis of 2-Pentanone Vapor, 01981-H

Detection of Low Levels of Tetrafluorohydrazine in Air, 08077-D

Detection and Measurement of Air Pollutants by Absorption of Infrared Laser Radiation, 11030-D

Detection and Measurement of Inflammable Vapours in Aircraft, 06471-D

Detection of Phenol in the Atmosphere With 4-Aminoantipyrene, 05378-D

Detection of Polycyclic Aromatic Hydrocarbons in Liquid Smoke and Some Foods, 06004-F

Detection of Polycyclic Aromatic Hydrocarbons in Polluted Atmospheres and Other Pollutants by Means of Qualitative Fluorescence Spectra, 14082-D

Detection of Polynuclear Phenyl Ketones, Application to Air Pollution, 01998-D

Detection and Prevention of Air Pollution in the U.S.S.R, 01205-A

Detection of Pyrene, Benzo(a)-pyrene, and Other Polynuclear Hydrocarbons, 01999-D

Detection of Ozone Forming Hydrocarbons in Automotive Exhaust Gases Using Plants as Indicators, 03554-B

Detection of Trace Quantities of Dichloromethane in Air, 14775-D

Detection of Volatile Organic Compounds and Toxic Gases in Humans by Rapid Infrared Techniques, 05561-D

Determination of Aerial Concentration of Decomposition and Oxidation Products of Certain Organochlorine Compounds (TDA, DDA, TDDA, and DDAC), 04246-C

Determination of Aldehydes in Automobile Exhaust Gas, 09341-B

Determination of Aliphatic Amines in Air, 04265-D 04265-M

Determination of Aromatic Content of Hydrocarbon Paint Solvents by Gas Chromatography, 03001-D

Determination of Aromatic Polycyclic Hydrocarbons in the Hazy Atmosphere of Siena, Italy, 06115-J

Determination of Atmospheric Pollutants in the Parts-Per-Billion Range by Gas Chromatography. (A Simple Sampling System for Use with Flame Ionization Detectors). 00036-D

Determination of Benzene, Toluene, and Xylene Simultaneously Present in the Air. 00081-D

Determination of 3,4-Benzpyrene in the Air in Teesboro. 00815-J

Determination of 3,4-Benzpyrene in the Atmosphere of a Refinery. 01150-D

Determination of 3,4-Benzpyrene Liberated by Sublimation of Anode Material in Electrolytic Cells of Aluminum Plants. 01540-D

Determination of 3,4-Benzpyrene in a Mixture by Fluorescence Spectrography at the Temperature of Liquid Air. 14058-D

Determination of 3,4-Benzpyrene in Products Occurring in the Manufacture of Synthetic Liquid Fuel. 07298-D

Determination of Carbon Tetrachloride in Air. 05210-D

Determination of Chlorinated Hydrocarbons in the Air by the Method of Micro-Combustion. 08130-D

Determination of Chlorinated Hydrocarbons in the Atmosphere by Activation Analysis. 06008-D

Determination of Chloroprene in Air. 02121-D

Determination of the Combined Effect of Toxic Substances in Prediction of Atmospheric Pollution. 11479-D

Determination of Dieldrin (HEOD) in Blood. 00858-D

Determination of Dimethylaminoazobenzene in Air. 03029-D

Determination of 4,4' Diphenylmethane Diisocyanate in Air Under Experimental Conditions. 03024-D

Determination of Ethyl Benzene, and Styrene in Air by Ultraviolet Spectrophotometry. 10772-D

Determination of Ethylene Oxide in the Atmosphere. 01305-D

Determination of Formaldehyde in Gas Mixtures by the Chromotropic Acid Method. 03600-D

Determination of Freon-11 in Air. 06870-D

Determination of Furfurol in the Air. 06803-D

Determination of Halogenated and Aromatic Hydrocarbons in Air by Charcoal Tube and Gas Chromatography. 11164-D

Determination of Hydrocarbon Content of the Air by Gas Chromatography. 13074-D

Determination of Lignin in Small Pulp and Paper Samples Using the Acetyl Bromide Method. 13505-M

Determination of Low 3,4-Benzpyrene Concentrations by Means of the Shpol'skii Effect. 04248-D

Determination of the

Maximum Permissible Concentration of Alpha-Methylstyrene Vapor in the Atmosphere, 01651-F

Determination of Upon Daily Maximum Permissible Concentration of Isopropylbenzene and Its Hydroperoxide in the Atmosphere, 03953-F

Determination of Methanone in Air, 08455-D

Determination of Nitrate or Nitrate Plus Nitrite With Aminopyrene; Application to Air Pollution, 01975-D

Determination of Nitrogen Oxides in Auto Exhaust, 04857-D

Determination of Olefins in Combustion Gases and in the Atmosphere, 02158-D

Determination of Organic Solvent Vapor-Air Mixtures by a Non-Dispersive Ultraviolet Gas Analyzer and Determination of Precision, 07380-D

Determination of Organic Substance Vapor-Air Mixtures by a Non-Dispersive Ultraviolet Gas Analyzer, 04100-D

Determination of Paraffin and Cerosin Aerosols in the Air of Industrial Plants, 07156-D

Determination of Polynuclear Aromatic Hydrocarbons in Air Particulate Matter, 04050-D

Determination of Primary Nitroparaffins by the Hilyard Acid Reaction, 03604-D

Determination and Significance of Gasoline Mid Octane Numbers, 01370-A

Determination of Small Concentrations of 1,2,5,6-Dibenzanthracene, 03607-D

Determination of Styrene in Air by Paper Chromatography, 11465-D

Determination of Styrene and Cumene Hydroperoxide in the Air When They are Present Together, 01595-D

Determination of the Toxicity of Propellants Used in Aerosol Tanks, 01601-D

Determination of Vinyl Chloride in the Air, 07146-D

Determination of the Volatile Components of Pembutuffa, IV, Coffee Arums, 03354-D

Determination of Water Soluble Additives in Liquid Hydrocarbon Fuels, 09089-M

Determining Air Pollutant Emissions From Transportation Systems, 10017-B

Determining Organic Contaminants in Air and Water, 14175-D

Determining Reduced-Emission Goals Needed to Achieve Air Quality Goals-a Hypothetical Case, 00158-B

Determining Source Reduction Needed to Meet Air Quality Standards, 00110-J

Detoxication of Automotive Exhaust Gases-Measuring Methods and Test Cycles, 13089-D

Development of Air

Containment Emission Tables for Nonprocess Emissions. 00073-B

Development of a Continuous Countercurrent Fluid-Solid Contactor; II, Adsorption. 02374-M

Development of a Cycle Controller for Chassis Dynamometer. 03547-A

Development of Impleted-Uranium Catalysts for Destruction of Air Pollutants in Automobile Exhaust. 05214-B

Development and Evaluation of Automobile Exhaust Catalytic Converter Systems. 07638-B

Development of an Improved Method of Sampling and Analysis for Atmospheric Iodine. 00682-D

Development of an Improved Process for the Catalytic Oxidation of Atmospheric Contaminants in Submarines. 00285-B

Development of a Simple Auto Exhaust Analyser. 10010-D

Development of a Simulation Model for Air Pollution Over Connecticut. Volume I. 14097-J

Development of Space Cabin Tolerance Criteria to Trace Contaminants. 00096-F

Development Work on Bioassay Techniques for Atmospheric Pollutants. 04551-F

Developments Toward the Remote Sensing of Vapours as an Airborne and Space Exploration Tool. 05101-D

Device for Sampling and Analysis of Metallurgical Furnace Atmospheres. 01558-B

Diesel Engine Exhaust Smoke: the Influence of Fuel Properties and the Effects of Using Barium-containing Fuel Additive. 09325-B

Diagnosis of Solvent Poisoning. 00747-D

Di-Disperse Octadecanol Aerosol With Ratio of Au(198) and Sc(46) Respectively. 01722-F

Diesel Engine Exhaust Gases. 14019-B

Diesel Engine Pollutants. Part I. Identification. 14007-B

Diesel Engine Pollutants. Part II. Control 14008-B

Diesel Exhaust Analysis (Preliminary Results) 02785-D

Diesel Exhaust Composition and Odor Studies. 02786-D

Diesel Exhaust Composition, Odor, and Eye Irritation. (Progress Report) May 1, 1962 to Feb. 15, 1963. 03542-D

Diesel Exhaust Gas, Investigation With Proposals for Action. 06280-B

Diesel Exhaust Odor (Its Evaluation and Relation to Exhaust Gas Composition). 05170-D

Diesel Smoke. 04628-B

Difference in Responses of Two Strains of Mice to Benzene Inhalation. 07368-F

Differential Determination of Organic and Inorganic Lead in the Air of Garages. 07285-D

Diffusion of Gases in Polyethylene Terephthalate. 15104-M

Digest of Municipal Air Pollution Ordinances. 03353-E

Digital Data Acquisition and Computer Data Reduction for the California Exhaust Emission Test. 05339-D

Dioxane Sulfotrioxide, a New Sulfating and Sulfonating Agent. 16082-M

Direct Application of Gas Chromatography to Atmospheric Pollutants. 01926-D

Direct Fluorometric Scanning of Thin-Layer Chromatograms and Its Application to Air Pollution Studies. 01252-D

Direct Hydrocarbon and Methanol-Air Fuel Cells. 00148-B

Direct Infrared Spectral Analysis of Contaminants in the Atmosphere (A Preliminary Study). 04651-D

Direct Measurement of Atmospheric Light Scattering Coefficient for Studies of Visibility and Air Pollution. 04931-D

Direct Measurement Technique for Automotive Exhaust Emissions. 04630-B

Direct Spectrophotofluorometric Analysis of Aromatic Compounds on Thin-Layer Chromatograms. 00011-D

Direct Spectrophotofluorimetric Analysis of Compounds on Paper and Thin-Layer Chromatograms and Fluorograms. 11068-D

Direct Spectrophosphorimetric Analysis of Organic Compounds on Paper and Thin-Layer Chromatograms. 00766-D

Discharge to Atmosphere at the Phenol Works. 14767-B

Discussion of Gas Chromatography-Measuring Exhaust Hydrocarbons Down to Parts Per Billion by L. J. Papa. 05135-D

Discussion of the Formula X Used in Computing the Amount of Fuel Required to Produce Combustion Gases at a Given Temperature in a Combustion Chamber or an Afterburner. 06625-M

Diseases of Crops and Ornamental Plants Incited by Air Pollutants. 12042-G

Dispersion and Deposition of Air Pollutants Over Cities. 03581-C

Disposal of Coal Tar Pitch Distillate Obtained From Carbon Baking Furnace by Catalytic Combustion. 07725-E

Disproportionation and Combination Reactions of Isopropoxy Radicals With Nitric Oxide. 16236-M

Dissociation of Gaseous Compounds by Electrically Induced Glowing. 16218-M

Distribution and Effects of

Automotive Exhaust Gases in Los Angeles. 07023-B

Distribution and Fate of the Carcinogenic Hydrocarbon Benz(a)pyrene (3,4, Benzpyrene) in the soil. 10009-G

Distribution of Methane and Carbon Monoxide Between the Atmosphere and Natural Waters. 14158-H

Distribution and Nature of Surface Wax in Pepper Spores and Mechanism of Wax Biosynthesis in Brassica oleracea. 10116-G

Distribution of Vehicular Air Pollution in the United States. 01830-J

Disturbing Factors in Particulate Sampling. 04040-D

Do Automotive Emissions Inhibit Fuel Characteristics? 01383-B

Driving With Methane. 16124-F

Dry Cleaning Equipment. 00820-B

Dry-Packed Beds for the Removal of Strong-Acid Gases From Recycled Atmospheres. 04279-H

Dual-Column Gas Chromatographic Method for the Analysis of Light Gases. 12668-D

Dust as a Germ Carrier in Working Rooms. 03365-E

Dynamic Irradiation Chamber Tests of Automotive Exhaust. 00068-D

Dynamic Irradiation Chamber Tests of Automotive Exhaust. Part I. 02244-B

Dynamic Model of Photochemical Smog. 15310-B

Dynamic of Vapor Mixtures. 01358-H

Easily Controllable Air Pollution Sources: Naphtha Engines. 07600-B

Ecological Factors Influencing Plants as Monitors of Photochemical Air Pollution. 00241-C

Economics of Changing Volatility and Reducing Light Olefins--U. S. Motor Gasolines. 13705-B

Economics of Hydrogen Production and Hydro Treating. 08594-E

Economics of Motor Vehicle Pollution Control. 00566-B

Effect of Adsorption in Barrier Separation. 15187-H

Effect of Air-Borne Oxidants on Biological Activity of Indoleacetic Acid. 06809-G

Effect of Air Ions on IAA Content of Barley Seedlings. 00801-G

Effect of Air Pollutants in Cells in Vitro. 06840-F

Effect of Air Pollutants on the Bl[illegible]. 01077-F

Effect of Air Pollutants

on Wildlife. 04544-G

Effect of Benzene on the Organism at Higher Air Temperature. 07308-F

Effect of Calcium Carbonate Dust on Ventilation and Respiratory Gas Exchange in Normal Subjects and in Patients With Asthma and Chronic Bronchitis. 08109-F

Effect of Certain Industrial Irritants on Change of Pupil Diameter in the Rabbit. 12969-F

Effect of Chronic Exposure to Low Concentration of Toluene on the Acetylcholine System in the Blood of Rabbits. 08461-F

Effect of Combustion Chamber Deposits and Driving Conditions on Vehicle Exhaust Emissions. 14033-H

Effect of Combustion Method and of Fuel Type on the Content of 3,4-Benzpyrene in Smoke Gases. 08200-H

Effect of Commercial Tune-ups on Automotive Exhaust Emissions. 05266-H

Effect of Electrical Discharges on Sublimation Condensation. 07405-M

Effect of Engine Exhaust on the Atmosphere When Automobiles are Equipped With Afterburners. 05265-H

Effects of Engine Operating and Design Variables on Exhaust Emissions. 07655-H

Effects of Some Engine Variables and Control Systems on Composition and Reactivity of Exhaust Hydrocarbons. 05325-H

Effect of Ethylene on Auxin Transport. 01179-G

Effect of Feeding Benzo(a)pyrene on Growth of Young Mice. 04710-F

Effect of Fuel Anti-knock Compounds and Deposits on Exhaust Emissions. 07466-H

Effectiveness of Exhaust Controls in Public Use. 09027-H

Effectiveness of Exhaust Controls on 1966 Vehicles. 11231-H

Effectiveness of Exhaust Controls of 1966 Vehicles by the State of California Motor Vehicle Pollution Control Board, Aug. 10, 1966. 06032-H

Effectiveness of Fuel Octane Number for Combustion Control in Bi-Fuel Diesel Engine. 04663-H

Effectiveness of Organic Solvents in Photochemical Smog Formation (Solvent Project, Final Report). 01875-M

Effects of Fuel Olefin Content on Composition and Smog Forming Capabilities of Engine Exhaust. 05701-H

Effect of High Flow-Resistance on the Response of Guinea Pigs to Irritants. 01584-F

Effect of Hydrocarbon Type of Reactivity of Exhaust Gases. 10129-M

Effect of Initial Concentration of Reactants

on the Biological Effectiveness of Photochemical Reaction Products. 04650-F

Effect of Intratracheal Injection of Benzo(a)pyrene on Ducks. 04711-F

Effect of Interfering Substances and Prolonged Sampling on the 1,2-di-(4-pyridyl) Ethylene Method for Determination of Ozone in Air. 03537-D

Effect of Lead Deposits on Activity of Automotive Exhaust Catalysts. 00015-E

Effect of Low Concentrations of Chloropyrene in the Atmosphere on Suprarenal Function in Children. 11171-F

Effect of Low Concentrations of Methanol Vapor on Man and Animals. 03918-J

Effect of Mixed Organic Solvents on Atomic Absorption Spectrophotometry of Refractory Metals. 04716-D

Effect of Naphthenic Soap on the Properties of Industrial Dust. 15014-E

Effect of Nucleating Particulates on Photochemical Aerosol Formation. 02412-H

Effect of Operating Variables on Automotive Hydrocarbon Emissions. 02753-E

Effect of Organic Materials in the Atmosphere on Vegetation. 05844-B

Effect of Other Hydrocarbons on the in Vitro Binding of 3,4-Benzpyrene by Plasma Proteins. 00055-F

Effect of Ozonation Upon Aromatic Hydrocarbons, Including Carcinogens. 10837-E

Effect of Ozone and Ozonated 1-Hexene on Respiratory and Photosynthesis of Leaves. 03617-G

Effect of Photochemically Produced Oxidants on Growth of Avena Coleoptile Sections. 06498-G

Effect of Recycling Combustion Products on Production of Oxides of Nitrogen, Carbon Monoxide and Hydrocarbons by Gas Burner Flames. 07801-E

Effect of Small Benzene Concentrations on Higher Nervous Activity of Animals in Chronic Experiments. 07306-F

Effect of Solar Radiation on the Presence of 3,4-Benzpyrene in Industrial Exhausts. 08485-J

Effect of Temperature on Photochemical Oxidant Production in a Bench Scale Reaction System. 01579-H

Effect of Temperature on Photochemical Smog Reactions. 00034-H

Effect of Volatile Substances and of Gases on the Higher Nervous Activity of White Rats in the Course of Inhalation Exposure. 08271-F

Effective Work Instrument: The Laboratory Truck Used by the Municipal Laboratory of Paris in a Study of Air Pollution. 00898-D

Effects of Air Contamination on Health: A Review, Part II. 08811-F

Effects of Air-Fuel Stoichiometry on Air Pollutant Emissions From an Oil-Fired Test Furnace. 05133-B

Effects of Air Pollutants on the Growth and Productivity of Plants. 03630-G

Effects of Air Pollution on Animals and Plants. 03116-G

Effects of Air Pollution on Dyed Fabrics. 00115-H

Effects of Air Pollution on Edible Crops. 00316-G

Effects of Air Pollution on Human Health. 00308-F

Effects of Air Pollution on Plants. 02587-G 01305-G

Effects of Air Pollution and Its Prevention on International Telecommunication Systems. 03215-H

Effects of Air Pollution on Textiles, Especially Synthetic Fibers. 02060-H

Effects on Animals of Exposure to Auto Exhaust. 03076-F

Effects of Atmospheres Contaminated With Irradiated Automobile Exhaust on Reproduction of Mice. 02552-F

Effects of Automobile Exhaust Gas Emission on Air Pollution. 10170-B

Effects of Benzo(a)-pyrene, Cigarette Smoke Condensate and Atmospheric Pollutants on the Respiratory System of Syrian Hamsters. 05372-F

Effects of Certain Aromatic Hydrocarbons in the Air. 11476-D

Effects of Chronic Exposure to Low Levels of Air Pollutants on Pulmonary Function in the Beagle. 11632-F

Effects of Combustion Gas Residence Time on Air Pollutant Emissions From an Oil-Fired Test Furnace. 11231-B

Effects of Design and Fuel Moisture on Incinerator Effluents. 06008-B

Effects of Emissions of Organic Solvents on Los Angeles Photochemical Smog. 03270-F

Effects of Engine Exhaust on the Atmosphere When Automobiles are Equipped With After-burners. 00087-E

Effects of Engine-Operating Variables on the Composition of Automotive Exhaust Gases. 05201-B 13567-B

Effects on Experimental Animals of Long-Term Inhalation Exposure to Mineral Spirits. 06196-F

Effects of Feeding Benzo-(a)pyrene on Fertility. 04712-F

Effects of Fuel Olefin Content on Combustion and Smog Forming Capabilities of Engine Exhaust. 03701-B

Effects of Gaseous Pollutants on Human Health. 16042-F

Effects of Halothane, Cyclopropane and Nitrous Oxide on Isolated Human Uterine Muscle. 16251-F

Effects of HC/NO$_x$ Ratios on Irradiated Auto Exhaust, Part II. 01058-B

Effects of High Volatile Fuel on Incinerator Effluents. 02232-B

Effects of Knock on the Hydrocarbon Emissions of a Spark-Ignition Engine. 14045-B

Effects of a Low Ethylene Concentration on the Growth of Cotton. 06546-G

Effects of 65/80 on the Mechanical Properties of the Lungs. 04629-F

Effects of the Motor Vehicle Exhaust Gases on Humans, Animals and Plants. 08801-F

Effects of Organophosphorus Esters on the Ciliary Movement and Their Use for the Detection of Traces of Organophosphorus. 02248-D

Effects of Particle Accumulation in Aerosol Filtration. 00182-H

Effects of Photochemical Aerosols on Eye Irritation. 01463-F

Effects of Photochemical Oxidants on Materials. 04520-H

Effects of Photosensitizing Polycyclic Atmospheric Pollutants on Single Cells. 06384-J

Effects of Polycyclic Aromatic Carcinogens on Viral Replication; Similarity to Actinomycin D. 01668-F

Effects of Radiation Quenching, Ion-Bombardment, and Annealing on Catalytic Activity of Pure Nickel and Platinum Surfaces. II. Hydrogenation of Ethylene (continued), Hydrogen-Deuterium Exchange. 14227-H

Effects of the Ratio of Hydrocarbons to Oxide of Nitrogen in Irradiated Auto Exhaust. 02042-F

Effects of Stability of Combustion on the Formation of the Oxides of Nitrogen. 03588-H

Effects of Temperature and of Ultraviolet Radiation on Pyrene Adsorbed on Carbon Soil. 06720-H

Effects of Tetraethyl Lead on Catalyst Life and Efficiency in Customer Type Vehicle Operation. 14459-B

Effects of Tetraethyl Concentration on Exhaust Emissions in Customer Type Vehicle Operation. 14463-B

Effects of a Transverse Electric Field on the Characteristics and Heat Transfer of a Diffusion Flame. 00172-H

Effects of Urban Fog Upon Cultivated Plants. 00235-G

Electric Cleaning of Waste Gases From Carbon Electrode Baking Furnaces. 10568-B

Electrocatalysis and Related Processes at the Hydrocarbon Anode, 14688-M

Electrochemical Cleaning of Industrial Waste Gases and Development of a Non-Toxic Layer Electrode, 14450-M

Electrohydrodynamic Removal of Microorganisms From Hydrocarbon Fuels, 01197-B

Electron Affinities of Aromatic Hydrocarbons in the Gas Phase and in Solution, 02750-M

Electron Transfer Oxidation of 7,12 Dimethylbenz(a) anthracene, a Model for the Metabolic Activation of Carcinogenic Hydrocarbons, 00024-F

Electronic Spectra of Normal Paraffin Hydrocarbons, 00030-M

Eliminating Odors by Catalytic Combustion, 07302-B

Elimination of 5 Micron Particles From the Human Lung, 00042-F

Elimination of HF From "Hot" Fluorinated Ethanes, An Estimation of the Activation Energies and Rate Parameters, 01677-M

Elimination of Nitrogen Oxide From Gas Streams, 15765-E

Elimination of Noxious Substances From Internal Combustion Engines, 00562-E

Emission-Type Discharge Study of Some Air Pollutant Compounds, 15004-D

Emissions From Carbureted and Timed Port Fuel Injected Engines, 01411-B

Emissions From Coal-Fired Power Plants: A Comprehensive Summary, 01482-B

Emissions From Gasoline-Powered Trucks Above 10,000-LB GVW Using PDS Proportional Sampling Techniques, 11254-B

Emissions and Pollutant Levels (Trends in Los Angeles), 02610-B

Emissions of Polynuclear Hydrocarbons From Automobiles and Trucks, 01404-B

Emissions of Polynuclear Hydrocarbons and Pollutants From Heat-Generation and Incineration and Processes, 01788-B

Emissions From Underground Gasoline Storage Tanks, 02911-B

Emphysema Profile in Two Midwestern Cities in North America, 11309-F

Energy Distribution of Photochemically Generated T-Pentoxy Radicals, 03066-M

Energy Generation From Liquid Fuels, 05477-B

Energy Sources and Policies: Their Impact on Air Pollution, Current and Projected, 00750-B

Engine Behavior Characteristics of L.P. - Gas Fuels, 05633-B

Engine Combustion and its Exhaust Gas Products as

a Problem of High Incidence. 02150-D

Engine Fuels With the Boiling Point of the Gasoline Containing a Cyclic Manganese Tricarbonyl Compound. 15275-H

Engine Generated Air Pollution a Study of Source and Severity. 01505-B

Engineering the Chronic Exposure of Animals to Laboratory Produced Automobile Exhaust. 01087-F

Engineering Control of Industrial Air Pollution: State of the Art, 1966. 01687-B

Engineering Investigation of Direct Liquid Hydrocarbon-Air Fuel Cells. 04233-B

Enhanced Desorption of Atmospheric Samples From Activated Carbon. 01419-D 15541-D

Environmental Aspects of Nuclear and Conventional Power Plants. 07548-B

Environmental Cancer. 01469-F

Environmental and Clinical Investigation of Workmen Exposed to Diesel Exhaust in Railroad Engine Houses. 00640-F

Environmental Influences on Living Cells. 01062-F

Environmental Health Research: Interaction of Sulfur and Other Atmospheric Contaminants. 08598-F

Environmental and Occupational Cancer Hazards. 02288-F

Epidemiology of Air Pollution. 00310-F

Establishing Hygienic Norms for Some Intermediates in Caprolactam Production in the Air. 03005-F

Estimated Activation Energies For the Four-Center Addition Reaction of H_2, HX, and X_2 to Acetylenes. 03062-H

Estimation of Temp Effects in the Hydrocarbon - Nitric Oxide System. 00355-C

Evaluating Air Pollution Problems (Acceptable Equipment and Procedures). 03527-D

Evaluation of the Adsorption Properties of Molecular Sieve 5A Coated With 10% WT/WT Triton x100. 15969-D

Evaluation of Air Pollution in the State of Washington (A Joint Report With the State of Washington Department of Health - July 1 Through November 30, 1956). 03504-J

Evaluation of Conjugated Nitro-Olefins as Eye Irritants in Air Pollution. 03490-F

Evaluating Effects of Fuel Factors on Stabilized Exhaust Emission Levels. 14461-B

Evaluation of Ethylene as an Air Pollutant Affecting Plant Life. 06078-G

Evaluation of a Gas Mixing System. 11545-H

Evaluation of Methods Used to Determine Injury to Plant Leaves by Air Pollutants. 05778-G

Evaluation of Microbiological Systems for

Estimating Air Polluting Substances. 01836-D

Evaluation of Optical Particle Counters (Progress Report). 02433-D

Evaluation of Polynuclear Hydrocarbons in Cigarette Smoke by Glass Capillary Columns. 03955-D

Evaluation of "Project H-Coal". 10047-E

Evaluation of Sulfur Compounds in Atmospheric Dust. 09430-C

Evaluation of Techniques for the Determination of the Photochemical Reactivity of Organic Emissions. 00465-C

Evaluation of Techniques for Measuring Air-Fuel Ratio. 01831-D

Evaluation of the Theory of Carcinogenic Aromatic Hydrocarbons. 00947-F

Evaluation of Various Silica Gels in the Gas Chromatographic Analysis of Light Hydrocarbons. 00562-D

Evaporative Loss Control Device. 02411-E

Evidence for a Functional Disulphide in Photophosphorylation. 00231-M

Examination of Commercial Solvents by Gas-Liquid Chromatography. Part I, Aliphatic Hydrocarbons. 02875-D

Excessive Emissions of Firedamp in the West Lancashire and North Wales Coalfields. 02152-B

Excretory and Biologic Threshold Limits. 00680-F

Exhaust Air Purification and Solvent Recovery in Gravure Printing. 16435-E

Exhaust Control Devices: An Investigation of Non-Catalytic Afterburning. 05966-B

Exhaust Controls for Air Pollution. 04376-E

Exhaust Controls Really Work? 09331-E 05420-E

Exhaust Emission Abatement by Fuel Variations to Produce Lean Combustion. 14975-E

Exhaust Emissions From Compact Cars. 04028-E

Exhaust Emission Control by Chrysler-The Cleaner Air Package. 00154-E

Exhaust Gas Cleaner. 16187-E

Exhaust Gas Measurements During a Simulated Traffic Jam in a Road Tunnel. 11913-E

Exhaust Gas Problem of Motor Vehicles. 07223-E

Exhaust Gas Problem of Motor Vehicles (Part 2). 07274-E

Exhaust Gas Problems With Gasoline and Diesel Engines. II, Diesel Engines. 08497-E

Exhaust Gas Problems With Gasoline and Diesel Motors. 08496-E

Exhaust Purifiers Clean the Air. 12998-E

Exhaust Gas Sampling Technique for Relating Emissions and Cycle Characteristics. 15883-E

Exhaust Hydrocarbon and Nitrogen Oxide Concentrations With an Ethyl Alcohol Gasoline Fuel. 15513-B

Exhaust Hydrocarbons Measurement for Theory Diagnosis. 00155-D

Exhaust System Devices for Petrol-Engined Vehicles. 02038-B

Experience With a Modified Method for Determination of the Total Amount of Combustible Organic Substances in Waste Gases. 16211-D

Experimental Basis for the Determination of Allowable Acetophenone Limits in Atmospheric Air. 04070-P

Experimental Cancer of the Lung. Inhibition by Vitamin A of the Induction of Tracheobronchial Squamous Metaplasia and Squamous Cell Tumors. 07340-P

Experimental Carcinogenesis of the Lung. 09435-P

Experimental Carcinogenicity and Acute Toxicity of Representative Epoxides. 00915-P

Experimental Data as a Basis for the Determination of the Maximal Permissible Amylenes (Pentenes) Concentration in Atmospheric Air. 04083-P

Experimental Data as a Basis for the Determination of Maximal Permissible Parathion (ENI 3-5 Concentration in the Air of Working Premises. 04092-P

Experimental Data as a Basis for the Determination of Maximal Permissible Toluylene Diisocyanate Concentration in Atmospheric Air. 04087-P

Experimental Data for the Hygienic Evaluation of Atmospheric Air Pollution With Styrol. 05054-P

Experimental Data on the Hygienic Substantiation of the Single Permissible Concentrations of Isopropylbenzene and Isopropylbenzene Hydroperoxide in Atmospheric Air. 02566-P

Experimental Determination of the Limit of Allowable Concentration of Dichlorethane in Atmospheric Air. 08151-P

Experimental Induction of Pulmonary Tumors in Strain-A-Mice After Their Exposure to an Atmosphere of Ozonized Gasoline. 01030-P

Experimental Instrument for the Continuous Measurement of the Concentration of Olefins in Air. 05583-D

Experimental Investigation of Electrical Conductivity of Products of Combustion, Stimulated by Solid Particles. 15481-H

Experimental Investigations About the Intake, Transport, and Metabolism of Cancerogenic Hydrocarbons in the Respiratory Tract. 14724-P

Experimental Program for the Control of Organic Emissions From Protective Coating Operations. 03762-E 03773-E 05648-B

Experimental Program for the Control of Organic Emissions From Protective Coating Operations (Interim Rept. No. 5- Development of Sampling and Analytical Methods), 05848-D

Experimental Research on the Link Between Atmospheric Pollution and Lung Cancer, 05804-F

Experimental Studies of the Conditions of Exposure to Carcinogens for Lung Cancer Induction, 00754-F

Experimental Study of Atmospheric Air Pollution With 3,4-Benzpyrene in Industrial Sections, 04091-J

Experimental Unit for Poisoning Animals With Viscous Liquid Aerosols, 15564-H

Exposure to Carbon Monoxide of Occupants of Vehicles Moving in Heavy Traffic, 00268-B

Exposure of Large City Inhabitants to Solid and Liquid Aerosols, 05274-F

Exposure of Microorganisms to Low Concentrations of Various Pollutants, 00092-F

Extended Testing of the Methane Ionization Detector, 15400-D

Extraction of Organics From Airborne Particulates: Effects of Various Solvents and Conditions on the Recovery of Benzo(a)pyrene, Benz(c)-acridine, and N-Benz-(de)anthracen-7-one, 06200-D

Eye Irritation as a Biological Indicator of Photochemical Reactions in the Atmosphere, 04845-F

Eye Irritation Formed During Photooxidation of Hydrocarbons in the Presence of Oxides of Nitrogen, 05819-F

Factors Affecting Carburator Vapor Losses, 04922-B

Factors Effecting the Response of Plants to Oxident Air Pollutants, 11072-G

Factors Influencing the Photodynamic Action of Benzo(a)pyrene on Escherichia coli, 07803-H

Factors Influencing Vehicle Evaporative Emissions, 09347-B

Fast Method for Determining Lead in the Air, 06804-D

Fate of Arenes Incorporated With Airborne Soot, 02203-H

Fate of Oxides of Nitrogen Through a Direct Flame Afterburner in the Exhaust of a Gasoline Engine, 00469-D

Fate of Pesticides in the Environment-a Progress Report, 04901-F

Feasibility Study of a Multipurpose Infrared Propellant Detector, 06284-D

Few Ideas on Countermeasure as to be Connection With Exhaust Gas From Gas-Works and Damage on Mandarin, 14944-E

Field Survey of Exhaust Gas Composition, 07629-b

Fight Against Air Pollution In Argentina Educational, Legal and Technological Aspects, 11087-B

Filtration of Waste Air From Dry Cleaning Machines, 14028-B

Fine Purification of Gases With a Highly Active Copper Catalyst, 13865-B

First Investigations on the Pollution of the Air of Turin by Polycyclic Aromatic Hydrocarbons, 10600-J

Five New Methods for the Spectrophotometric Determination of Alkylating Agents Including Some Extremely Sensitive Autocatalytic Methods, 00765-D

Flame Characteristics Causing Air Pollution, 06299-B

Flame Characteristics Causing Air Pollution: Production of Oxides of Nitrogen and Carbon Monoxide, 04653-M

Flame Emission and Dual Flame Emission-Flame Ionization Detectors for Gas Chromatography, 05967-D

Flame-Ionization Chromatography for Determination of Organic Matter in Air, 11490-D

Flame Ionization and Combustion Inhibition, 11210-M

Flame Ionization Hydrocarbon Analyser, 05617-D

Flash Photolysed Reactions Monitored by Time-of-Flight Mass Spectrometry, 10034-D

Flow of Gases Through Polyethylene, 15268-M

Flow of Gases Through Porous Solids Under the Influence of Temperature Gradients, 15125-M

Fluorescence of Chickens and Eggs Following the Feeding of Benzpyrene Crystals, 04713-F

Fluorescence-Quenching Effect in Thin-Layer Chromatography of Polynuclear Aromatic Hydrocarbons and Their Aza Analogs, 01826-D

Fluorescence Spectroscopy in the Analysis of Air Samples, 0.908-D

Fluorescent Detection and Spectrophotofluorometric Characterization and Estimation of Carbazoles and Polynuclear Carbazoles Separated by Thin-Layer Chromatography, 00912-D

Fluorescent Dye Tracer as a Means for Determining Physical Decay Rates of Aerosols, 06504-D

Fluorides and Other Chemical Air Pollutants Affecting Animals, 05421-G

Fluorimetric Assay for Alpha-Glycolic Compounds and Other Aldehyde Precursors, 05136-D

Fluorophotometric Determination of Trace Amounts of Atmospheric Ozone, 00328-D

Foams for Dust Control at Sub-Zero Temperatures, 06305-B

Formation of Ozone in Los Angeles Smog. 04092-M

Formation of Peroxide Radicals During Photochemical Oxidation of Hydrocarbons. 13364-M

Formation of Photochemical Aerosols. 01318-M

Formation of Polycyclic Aromatic Hydrocarbons During Incomplete Combustion. 05525-M

Formation of Polycyclic Aromatic Hydrocarbons in Pre-Mixed Acetylene-Oxygen Flames. 05345-M

Formation of Polyenic Dialdehydes in the Photooxidation of Pure Liquid Benzene. 08827-M

Formation of Soot and Polycyclic Aromatic Hydrocarbons in Diffusion Flames--Part One. 10741-B

Formation of Soot and Polycyclic Aromatic Hydrocarbons in Diffusion Flames. Part Three: Effect of Additions of Oxygen to Ethylene and Ethane Respectively as Fuels. 12086-D

Formation and Suppression of Emissions From Steelmaking Processes. 06611-B

Forward-Looking Exhaust Gas Research for the Automotive Petrol Engine. 15521-E

Four Channel Chromatography for Rapid Gas Analysis. 09365-D

Four-Year Summary Data From the Continuous Air Monitoring Program. 11267-J

Fractionation and Analysis of a Micro Scale by Gas Chromatography. 05578-D

Free-Radical Addition to Azobenzene in Cumene Solution. Electron Paramagnetic Resonance Spectra of Some Long-Lived Radical Intermediates. 02495-M

Freezing Point of Gaseous Mixtures at Very Low Temperatures. 16169-M

Fresno Air Pollution Study. 03433-J

Fuel Additives for the Suppression of Diesel Exhaust Odor and Smoke. 11234-E

Fuel Cell Catalysts. 04272-B

Fuel Cell Energy Storage Hybrid Systems for Vehicles. 08875-B

Fuel Cell Fuel Studies. (Interim Technical Report, 10 January 1967-9 July 1967). 09106-B

Fuel Cells. 04316-B

Fuel Cells and Fuel Batteries--an Engineering View. 06950-B

Fuel Cells: Principle of Operation, Design and Present State of the Art in Fuel Cell Development. 07853-B

Fuel Cells; Its Promise and Problems. 03887-B

Fuel Cells: A Review of Government-Sponsored Research, 1950-1964. 07979-B

Fuel Economy Gains From Heated Lean Air-Fuel Mixtures in Motorcar Operation, 02956-B

Fuel Injection Increases Economy Reduces Exhaust Emissions, 03999-B

Fuel Oil Additives for Controlling Air Contaminant Emissions, 04856-B

Fume Control in Rubber Processing by Direct-Flame Incineration, 00257-B

Fume Destroying Process, 15467-B

Fume and Odor Destruction by Catalytic Afterburners, 14341-B

Fundamental Investigation of the Catalytic Degradation of Hydrocarbon Fuels, 05208-M

Fundamental Problems of Industrial Hygiene in Processing of Polyfluorethylene Resins, 08486-B

Fundamental Studies of Adsorption of Gases and Vapours by Active Bentonite, 13666-M

Further Developments in the Chemistry of the Atmosphere, 05027-J

Further Effects of Temperature and Pressure on Photochemical Oxidant Production, 02747-D

Future Emission-Controlled Spark-Ignition Engines and Their Fuels, 13958-B

Gas Absorption Equipment, 09795-B

Gas Chromatograph for the Apollo Spacecraft, 01430-D

Gaschromatograph Column Circuit for Analysis of Gases in Closed System for Biological and Biomedical Investigations, 08285-D

Gas Chromatographic Analyses of the Principal Constituents of Mine Atmospheres, 14839-D

Gas Chromatographic Analysis of Aromatic Hydrocarbons at Atmospheric Concentrations Using Flame Ionization Detection, 02159-D

Gas Chromatographic Analysis of Atmospheric Pollutants in Industries, 04206-D

Gas Chromatographic Analysis of Hydrocarbons in the Los Angeles Atmosphere, 01980-J

Gas Chromatographic Analysis of Paraffins and Olefins in Complex Hydrocarbon Mixtures: Chemical Fractionation With Dual High-Capacity Tubular Columns, 00772-D

Gas Chromatographic Analysis of Polycyclic Aromatic Hydrocarbons in Soot Samples, 14301-D

Gas Chromatographic Analysis of Polynuclear Aromatic Hydrocarbons With Packed Column (Application to Air Pollution Studies), 01238-D

Gas Chromatographic Analysis Shows Influence of Fuel on Composition of Automotive Engine Exhaust, 01382-B

Gas Chromatographic Determination of Benzo(a)-pyrene in Cigarette Smog, 10964-D

Gas Chromatographic Determination of Hydrocarbons in Automobile Exhaust, 12001-D

Gas-Chromatographic Determination of Organic Compounds in Air and in Presence of Ozone, 14500-M

Gas Chromatographic Determination of Polynuclear Hydrocarbons in Particulate Air Pollutants, 10946-D

Gas Chromatographic Study of Some Chlorinated Hydrocarbons, 02812-M

Gas Chromatographic Techniques for the Identification of Low Concentrations of Atmospheric Pollutants, 01178-D

Gas Chromatography in Air Pollution Studies, 01979-D

Gas Chromatography for the Analysis of Exhaust Gases, 05263-D

Gas Chromatography of Cigarette Smoke, Part III, Separation of the Overlap Region of Gas and Particulate Phase by Capillary Columns, 01278-D

Gas Chromatography-Measuring Exhaust Hydrocarbons Down to Parts Per Billion, 00342-D

Gas Chromatography of Small Amount of Hydrocarbons in the Atmosphere, 01701-C

Gas Emission From Broken Coal, 13882-M

Gas Phase Oxidation on Methyl Mercapten, 06719-E

Gas Phase Oxidation of Methyl Sulfide, 00912-C

Gas Phase Radiolysis of Cyclopentene, 00190-M

Gas Phase Reactions of Nitrogen Oxides With Olefins, 01981-J

Gas Phase Titration of Atmospheric Ozone, 10489-D

Gas Purification and Separation Process, 15862-E

Gas Release From Coal as a Function of the Rate of Heating, 10429-E

Gas Removal From Bituminous Coal Pits in the Ostrava-Karvina District, 04179-E

Gas Sorption by Suspensions of Activated Carbon in Water, 05869-E

Gas Transport in Thermally Conditioned Linear Polyethylene, 15165-M

Gas Utilization Today and in the Future, 08304-E

Gaseous and Particulate Emissions From Shale Oil Operations, 01838-E

Gasoline Composition as a Factor in Air Pollution, 06534-E

Gastric Carcinomas and Pulmonary Adenomas in Mice Fed Benzo(a)pyrene, 04714-F

General Motors Air Injection Reactor System for the Control of Exhaust Emissions, 01132-E

Generation of Countable Pulses by High Concentrations of Subcountable

Sized Particles in the Sensing Volume of Optical Particle Counters. 06203-D

Generation and Decay of Small Ions. Section IV: The Charging and Mobility of Chain Aggregate Smoke Particles. (Progress Report). 00861-D

Genesis of Phytotoxic Air Pollutants and Their Identification and Measurement by Chemical and Phytological Methods. 16357-G

Genetic Effects of Polynuclear Hydrocarbons: Induction of Mitotic Gene Conversion. 14709-M

Giant-Pulse-Laser Flash Photolysis of Phthalocyanine Vapor. 15019-M

Growing Problem. 09310-A

Guide to Operation of Atmospheric Analysers. 09515-D

Guide to the Selection of Methods for Measuring Air Pollutants. 08702-D

Halogenated Compounds as Gaseous Meteorological Tracers: Stability and Ultrasensitive Analysis by Gas Chromatology. 01650-G

Hazards to Health. 05650-F

Hazards of Painting and Varnishing 1965. 00746-D

Health Aspects of Air Pollution From Investigators. 01941-D

Health Hazards Associated With Work in Confined Spaces. 00885-F

Health Hazards of Automobile Exhaust. 00020-D

Health Hazards of Community Air Pollution. 05882-F

Health Hazards of Electroplating. 05790-F

Health Hazards of the Pesticides Endrin and Dieldrin (Hazards in Some Agricultural Uses in the Pacific Northwest. 06496-F

Health Impairment From Exhaust Gases With Special Reference to Special Vehicles and Power Equipment. 07052-F

Health Problems Resulting From Prolonged Exposure to Air Pollution in Diesel Bus Garages. 06055-D

Health Supervision of Organic Solvent Handlers. 04148-F

Health and the Urban Environment. 10987-F

Health and the Urban Environment (Air Pollution and Family Illness: II, Two Acute Air Pollution Episodes in New York City). 00682-J

Health and the Urban Environment: Health Profiles Versus Environmental Pollutants. 01360-F

Hearings-S.306, A Bill to Amend the Clean Air Act to Require Standards for Controlling the Emission of Pollutants From Gasoline-Powered or Diesel-Powered Vehicles, to Establish a Federal Air Pollution Control Laboratory and for Other Purposes. 00003-H

Heat of Adsorption of Gases by Coal and Charcoal.

13636-M

Helical-Coil Distillation Columns. Part I: Efficiency Studies. Part II: Liquid Film Resistance. 15851-M

Hematological Study on Tri-and Perchlorethylene Workers. 03898-F

Hepatotoxicity of Inhaled Trichloroethylene and Tetrachloroethylene Long-Term Exposure. 05729-F

Heterogeneous Reactions in a Free Fall Reactor. 16207-M

High Cost of Foul Air. 12045-G

Hot Gas Engine Revival. 15418-E

How to Increase Liquid Recovery From Your Gas-Condensate Oil Wells. 16417-I

How to Protect Elastomer Parts From Ozone Attack. 03995-H

How to Study Effect of Blow-by Gas. 03596-B 01560-D

Hydrocarbon - Air Fuel Cells. 02445-M 03543-M 07682-M

Hydrocarbon-Air Fuel Cell Using an Acid Electrolyte. 02442-E

Hydrocarbon Content of Urban Air-A Six Month Survey. 02762-J

Hydrocarbon Constituents of Automobile Exhaust Gases. 04094-B

Hydrocarbon Control for Los Angeles by Reducing Gasoline Volatility. 14465-B

Hydrocarbon Reactivity and Eye Irritation. 14119-F

Hydrocarbon Reactivity and the Kinetics of the Atmospheric Photooxidation of Nitric Oxide. 03114-M

Hydrocarbon Reactivities of Motor Fuel Evaporation Losses. 14264-E

Hydrocarbon Types Determine Smog-Forming Potential of Exhaust Gases. 06698-M

Hydrocarbons C_2-C_6 in the Los Angeles Atmosphere. 14180-J

Hydrocarbons Found in Waxy Layers From Spores of Basidiomycetes. 10118-F

Hydrochloric Acid Manufacture, Report No. 3. 02136-E

Hydrocracking Spreads Into New Areas. 10458-E

Hydrogen-Air Flame Chemiluminescence of Some Organic Halides. 11097-M

Hydrogen Sulfide as a Free Radical Interceptor in the Gas-Phase Radiolysis and Photolysis of Propane. 00629-C

Hydrogen Reforming for Fuel Cells. 14519-E

Hydrogenolysis-an Identification Tool. 08118-M

Hygienic Assessment of Odor of Nonmetallic Building Materials. 11486-D

Hygienic Characterization of Labor Conditions in the Chloroprene Industry. 05184-B

Hygienic Conditions on Molding Polyester Glass Reinforced Plastics. 00905-B

Hygienic Criteria of Air Purity in Populated Areas (According to Materials of the Geneva Symposium). 00885-L

Hygienic Evaluation of Vinyl as an Atmospheric Air Pollutant. 05949-F

Hygienic Evaluation of Some Petrochemical Industries. 08524-B

Hygienic Standardization of Alphamethylstyrene in Atmospheric Air. 12284-F

Hygienic Standardization of the Limits of Allowable Concentrations of Vapors of Gasoline in Atmospheric Air. 08153-F

Ice Fog: Low Temperature Air Pollution (Defined With Fairbanks, Alaska as Type Locality.) 00834-G

Identification of Aerosol Propellants in Paint Products by Gas-Liquid Chromatography. 00337-B

Identification of Air Pollution Damage to Agricultural Crops. 05542-G

Identification of Aliphatic Amines in Air as Their Benzamides by Paper Chromatography. 02210-J

Identification of Aromatic Compounds as Simple Azines by Paper and Thin-Layer Chromatography. 01581-D

Identification of Aromatic Ketones in Cigarette Smoke Condensate. 16701-D

Identification and Determination of Unusual Functional Groups. 00928-D

Identification and Distribution of Air Pollutants Through Plant Response. 03615-G

Identification of Some Oxygenates in Automobile Exhausts by Combined Gas Liquid Chromatography and Infrared Techniques. 06699-D

Identification of Vehicle Tire Rubber in Roadway Dust. 04895-D

Identification of Volatile Compounds in Kraft Mill Emissions. 07214-B

Identification of Volatile Contaminants of Space Cabin Materials. 04234-B 08033-B

Ignition and Combustion Properties of Activated Carbon Containing Absorbed Hydrocarbons. 05209-B

Immunologic Method in Air Pollution Research. 02173-F

Immunologic Responses in the Nitro-Olefins. 00218-F

Importance of Local Retention of Carcinogenic Agent in Pathogenesis of Lung Cancer. 06268-F

Improved Absorbers for Sampling Air Contaminants. 02474-B

Improved Desorption Route to Normal Paraffins. 00583-B

Improved Detection and

Identification of Incapacitating and Lethal Agents. 07898-D

Improved Evaluation of Polynuclear Hydrocarbons in Atmospheric Dust by Gas Chromatography. 05981-D

Improved Sampling Value for Gas Chromatography. 07104-D

Improved Sulfur-Reacting Microcoulometric Cell for Gas Chromatography. 00942-D

Improvement in Exhaust Gas Composition of Carburator Engines. 15257-E

Improvements in the Determination of Benzo(a)-pyrene in Air Samples. 06380-D

Improvements in the Processes and Operation of Plants in the Chemical Industry Leading to Reduced Emission. 11058-E

Improving Visibility During Periods of Supercooled Fog. 06482-C

Impurities in the Air and Their Influence on Plant Life. 04284-C

Inquiry into Atmospheric Pollution in the City of Pescara. 14785-J

Incineration of Epoxy Glass Laminates to Recover Precious Metals. 14609-E

Increasing Sensitivity of 3-Methyl-2 Benzothiazolone Hydrazone Test for Analysis of Aliphatic Aldehydes in Air. 01801-D

Indication of the Presence of Organochlorine Insecticides in Rain Water in Central England. 16526-E

Indicator Method for Determination of Xylene Vapor in the Air. 10089-D

Industrial Gas Analysis: A Literature Review. 09369-D

Industrial Hygiene Handbook. 04529-E

Industry Action to Combat Pollution. 01546-E

Influence of Air-Fuel Ratio, Spoil Timing and Combustion Chamber Deposits on Exhaust Hydrocarbon Emissions. 03456-E

Influence of Atmospheric Dispersion on the Exposure of Plants to Airborne Pollutants. 11010-C

Influence of Engine Variables on Exhaust Emissions From Automobile Engine During Acceleration. 16152-D

Influence of Fuel Types of Composition of Automotive Engine Exhaust. 12967-E

Influence of Gasoline Composition on the Constitution of Engine Exhaust (Part II of Atmospheric Pollution: A Survey of Some Aspects of the Emissions From Petrol-Engined Vehicles and Their Treatment). 02636-E

Influence of Gasoline Injection on the Exhaust Gases of Motor Vehicles. 05380-E

Influence of Improved Mixture Quality on Engine Exhaust Emissions and Performance. 07846-E

Influence of Inlet Air Conditions on Carburetor Metering. 01850-E

Influence of a Magnetic Field on the Viscosity of CH_4 and CF_4 (Rough Spherical Molecules). 15088-M

Influence of Methemoglobinemia on the Lethality of Some Toxic Anions. 04917-F

Influence of N-P-K Fertilization on Incidence and Severity of Oxidant Injury to Mangles and Spinach. 05066-G

Influence of Natural and Synthetic Sulphur- and Nitrogen-Containing Compounds of the Thermooxidising Stability of Diesel Distillates of Fuels. 02074-H

Influence of Pathogenic Viruses on Cancers Induced by Inhalation. 11275-F

Influence of Polycyclic Aromatic Hydrocarbons on Bacteriophage Development, II. 07782-F

Influence of Potassium Chloride on Combustion Processes Leading to Ignition. 04926-H

Influence of Vehicle Operating Variables on Exhaust Emissions. 00324-B

Infrared Absorption by Overlapping Bands of Atmospheric Gases. 08838-D

Infrared Analysis of Multicomponent Gas Mixtures. 06070-D

Infrared Spectroscopy Application to Chemical Kinetic Systems. 14917-H

Inhalation Studies on Chloropentafluoroethane. 01426-F

Inhibition of Flowering in Xanthium pensylvanicum Wallr. by Ethylene. 07167-G

Initial Lung Clearance of Di-disperse (3 Micron and 7 Micron) Polystyrene Particles in Rabbits. 12580-F

Injurious Effects of Atmospheric Dusts. 02963-D

Insecticidal Compounds (Effects on Replication of Vaccine and Polio Viruses in Human Chang-Strain Liver Cells). 06847-F

Insecticide Compound and Method of Dispensing an Insecticide. 15996-B

Inspection Method for Automobile Hydrocarbon Emission. 08681-D

Inside Air Pollution--the View From NBS. 08645-H

Instantaneous Monitoring of Multicomponent Expired Gases. 02406-D

Instrumentation for Air Pollution Monitoring. 00141-D

Instrumentation for Ambient Air Animal Exposure Project. 06099-F

Instrumentation for Automatic Measurement and Recording of Laboratory-Produced Automobile Exhaust. 01495-D

Instrumentation for Olefin Analysis at Ambient Concentrations. 04960-D

Interaction of Nitrogen Dioxide--Olefin Gas Mixtures With Lecithin Monomolecular Films, 05897-F

Interaction of Protein and Lipoprotein Monolayers With Nitrogen Dioxide-Trans 2-Butene Gaseous Mixtures, 11682-F

Interaction of Submicron Smog Particles and Vapors, 00069-M

Interactions of Sulfur Dioxide With Polar Compounds. Effects Observable in the UV Absorption Spectrum, 15329-M

Interactions Between Sulfur Dioxide and Polar Compounds, II, Thermodynamic Parameters of Complex-Forming Reactions, 15439-M

Interferometric Measurement Methods of Air Pollution, 07403-D

Interstate Air Pollution Study Phase II Project Report, II, Air Pollutant Emission Inventory, 11224-J

Interstate Air Pollution Study: Phase II Project Report, III, Air Quality Measurements, 03449-D 03866-D

Interstate Air Pollution Study Phase II Project Report, VI, Effects of Air Pollution, 03027-J

Interstate Air Pollution Study: Phase II Project Report VIII, A Proposal for an Air Resource Management Program, 01800-B

Interstate Air Pollution Study: St. Louis-East St. Louis Metropolitan Area, 01804-K

Intramolecular Energy Transfer: Photoelimination of Halogen Atoms From Aromatic Esters, 00017-M

Inverse Polarographic Determinations of Traces of Lead in Mixtures of Technical Hydrocarbons, 05456-D

Investigating Soot and Atmospheric Dust in the Hamburg Area, 01714-D

Investigation of the Autoxidation of Petroleum Fuels, 03164-B

Investigation of Catalytic Combustion of Impurities of Air, 08082-E

Investigation of the Combustion Products of Alkyl-Lead Compounds, 05440-M

Investigations into the Composition of End Gases From Otto Cycle Engines, 04731-B

Investigation to Determine the Possible Need For a Regulation on Organic Compound Emissions From Stationary Sources in San Francisco Bay Area, 03104-J

Investigation of Diesel Powered Vehicle Odor and Smoke, 01867-F 04888-E

Investigation of Diesel Powered Vehicle Odor and Smoke-Part 2, 06039-B

Investigation into Dust-Caused Damage, Especially Carcinogenic Effects, 00715-F

Investigation of the Dynamics of the Adsorption of Benzene by Activated Charcoals With Various Porous Structures and Grain Sizes. Communication 3. Analysis of the Kinetic Factors in Connection With the Porous Structure Activated Charcoals. 16348-H

Investigation of the Effect of Air Pollution on the Health of Children. 04037-F

Investigation of the Oxidation Kinetics of Gaseous Sulfur Dioxide in Water Solutions and the Processes of Contamination of Manganese Sulfate With Phenol. 16465-H

Investigation of Thermionic Detector Response for the Gas Chromatography of P,N,As, and C, Organic Compounds. 07749-D

In Vitro Effect of Aliphatic Nitro Compounds on Tissues. 04575-F

In Vitro Pulmonary Compliance and Physiopathology of Guinea Pig Lungs Exposed In Vivo to Gadolinium Oxide Dust. 00176-F

Iodine and Nitric Oxide Catalized Isomerization of Olefins. V. Kinetics of the Geometrical Isomerization of 1,3-Pentadiene, a Check on the Rate of Rotation About Single Bonds, and the Allylic Resonance Energy. 01880-H

Iodine and Nitric Oxide Catalyzed Isomerization of Olefins. VII. The Stabilization Energy in the Pentadienyl Radical and the Kinetics of the Positional Isomerization of 1,4-Pentadiene. 01880-H

Ion Exchangers in Removal of Air Contaminants. 07884-E

Irksomeness of Exhaust Gas Odor. 08604-E

Irradiated Automobile Exhaust. 07842-F

Irradiation of Single and Multi-component Hydrocarbon - and Aldehyde-Nitric Oxide Mixtures in Air Under Dynamic and Static Flow Conditions. 00612-F

Irritant Potency of M-Terphenyl of Different Particle Sizes. 06910-F

Isolation, Identification, and Estimation of Gaseous Pollutants of Air. 00214-D

Kanawha Valley Air Pollution Study Health Effects. I. Design of the Study. 11261-F

Kanawha Valley Air Pollution Study Health Effects. II. Conduction of Study. 11259-F

Kanawha Valley Air Pollution Study Health Effects. III. Symptom Response to Daily Measures of Air Pollution. 11260-F

Kilowatts for Cars - a Comparison of Energy Costs for Electric Automobiles. 11265-H

Kinetic Analysis of Odor Formation in the Kraft Pulping Process I. 01885-H

Kinetic Model of the Accumulation of Gaseous Substances in the Organism During Periodic Inhalation. 13657-F

Kinetic Studies in Stirred Reactors: Combustion of Carbon Monoxide and Propane. 02255-M

Kinetics of the Adsorption of Pure Hydrocarbons by Synthetic Zeolites. 01891-M

Kinetics and Catalysis of the Reaction Between Sulfur and Hydrocarbons. 09197-M

Kinetics of Hydrocarbons in Engine Exhaust Systems. 15951-B

Kinetics of the Hydroremoval of Sulfur, Oxygen, and Nitrogen From a Low Temperature Coal Tar. 10775-B

Kinetics and Mechanism of the Gas Phase Reaction Between Iodine and Formaldehyde and the Carbon-Hydrogen Bond Strength in Formaldehyde. 03088-M

Kinetics and Mechanism of Hydrogenolyses. The Addition of Hydrogen Atoms to Propylene, Toluene, and Xylene. 09700-M

Kinetics and Mechanism of the Pyrolysis of 1,4-Cyclohexadiene. 07457-M

Kinetics and Mechanism of the Reaction If Plus C_3H_6 = C_3H_{5I} Plus HI and the Heat of Formation of the Allyl Radical. 03067-M

Kinetics of the Reaction of O(3p) With Methane in Oxygen, Nitrogen, and Argon Mixtures. 01771-M

Kinetics of Vapor Phase Hydrocarbon-Ozone Reactions. 00775-C

Laser-Excited Vibrational Fluorescence and Energy Transfer in Methane. 15020-M

Laser-Induced Infrared Fluorescence. 15119-M

Laser-Induced Luminescence and Dissociation in Biphenyl. 15055-M

Laser Oscillations at Sub-millimetre Wavelengths From Pulsed Gas Discharges in Compounds of Hydrogen, Carbon, and Nitrogen. 16257-M

Laser Photolysis and Spectroscopy in the Nanosecond Time Range: Excited Singlet State Absorption in Coronene. 15491-M

Latest State of Development of Instruments for the Continuous Monitoring of Gas Emissions. 11061-D

Lead in Gasoline: No Effect on Exhaust Emissions Found in 18-Month Consumer-Car Test. 09355-B

Leaf Injury on Tobacco Varieties Resulting From Ozone, Ozonated Benzene-1 and Ambient Air of Metropolitan Areas. 00184-G

Leeward Deposition of Particles on Cylinders From Moving Aerosols. 07705-M

Levels of Chlorinated Hydrocarbon Pesticides in Human Tissues. 03662-F

Life Processes of Plants as Affected by Air Pollution. 04998-G

Linear-Colorimetric Method for the Determination of Carbon Dioxide in Air, 08226-D

Liquid Fuels in Central Heating Installations for Urban Heating, 07204-A

Liquid Fuels From Coal With H-Coal, 09195-B

Liquid Methane....A Cheaper Means vs. Peak Shaving? 16485-M

Liquid Phase Photolysis of Y-Butyrolactone, 00935-C

Literature and Research Survey to Determine Necessity and Feasibility of Air Pollution Research Project on Combustion of Commercially Available Fuel Oils, 01626-B

Long-Term Effect of Low Concentrations of Ethylene and Trichloroethylene on Newborn Animals, 11484-F

Long Term Inhalation Exposure Experience With Reference to Air Pollution, 03823-F

Longevity of the Phytotoxicant Produced From Gaseous Ozone-olefin Reactions, 03573-G

Look at Lead Economics in Motor Gasoline, 11204-I

Los Angeles Rule 66 and Exempt Solvents, 07187-B

Low Ambient Pressure and Toxicity, 00429-F

Low-Level Air Sampling and Meteorological Scaling System, 00188-D

Luminescent Smoke Generation Feasibility Study (Final Report), 11615-B

Lung Cancer Morbidity in Relation to Air Pollution, 05238-F

Lung-Cancer Mortality as Related to Residence and Smoking Histories, 03486-F

Lymphoma and Chronic Occupational Benzene Poisoning, 04177-F

Macromolecular Compounds Isolated From Airborne Particles by Electrophoresis and Paper Chromatography, 01991-D

Malodorous Products From the Combustion of Kraft Black Liquor, I. Pyrolysis and Combustion Aspects, 08359-B

Malodorous Products From The Combustion of Kraft Black Liquor, II. Analytical Aspects, 08354-D

Man and Air in California, 00060-B

Management of Dade County's Air Resources, 03404-J

Man's Tolerance to Trace Contaminants, 11793-F

Manual Methods and Automatic Continuous Instruments for Measurement of Gaseous Air Pollutants, 15171-D

Mass Spectrometric Determination of the Aliphatic and Aromatic Content of a Hydrocarbon Mixture, 05257-D

Mass Spectrometric Investigation of Reaction

of Oxygen Atoms With Methane. 04483-M

Mass Transfer in Drops Under Conditions that Promote Oscillation and Internal Circulation. 00633-E

Materials Deterioration and Air Pollution (Present Status of the Public Health Service's Program). 02380-H

Materials for Determining the Maximum Permissible Concentration of Chlorobenzol in Atmospheric Air. 00892-F

Materials for Space Cabins: The Fir Hazard and Atmosphere Contaminant Control Problems. 00023-B

Maximum Emission Concentrations of Organic Compounds. 07079-L

Maximum Permissible Concentration of Dicyclohexylamine Nitrite in the Air of Factories. 07574-P

Maximum Permissible Concentration of p-Chlorophenyl Isocyanate in Factory Air. 04258-F

Maximum Permissible Concentration of Ethylene Oxide in the Atmosphere. 00895-P

Maximum Permissible Concentrations of Harmful Substances in Atmospheric Air Populated Places. 02580-L

Maximum Permissible Concentration of Tetrachloroethylene in Factory Air. 04253-F

Maximum Permissible Concentration of Thiophene in Atmosphere. 08443-F

Maximum Temperatures Attainable by Combustion of Carbon and Methane in Air. 14622-M

Measurement of Air Pollution Around Oil Refineries. 16016-D

Measurement of Air Pollutants. 06112-D

Measurement of Automobile Exhaust Gas Hydrocarbons. 06057-D

Measurement of Benzo(a)pyrene, Benzo(k)fluoranthene and Benzo(g,h,i)perylene by Ultraviolet Spectroscopy. 00643-D

Measurement of the Exhaust Composition of Selected Helicopter Armament 07451-D

Measurement of Infrared Emission Spectra Using Multiple-Scan Interferometry. 03485-D

Measurement of Polycyclic Aromatics in the Atmosphere. 02685-D

Measurements of Methane in the Troposphere and Lower Stratosphere. 03675-C

Measurements of Particulate Air Pollutants With Two Filter Apparatus of Different Upper Separation Limits. 15898-D

Measurements of Styrene Emissions and Immissions With the Aid of Gas Chromatography. 15287-J

Measuring the Concentration of Organic Substance in Waste Gases by Adsorption

and Infrared Spectrometry. 12072-D

Measuring and Evaluating Automobile Exhaust Hydrocarbon Emissions by Interrelated Techniques. 11237-D

Measuring the Total Hydrocarbons in Diesel Exhaust. 09345-D

Mechanism of Action of Ferrocene on Smoke Reduction in Diffusion Flames. 04610-B

Mechanism of Action of the New Antiknock Compound Manganese Cyclopentadienyl-tricarbonyl on the organism. 14596-F

Mechanism of Carbon Formation. 15988-M

Mechanism of Coke and Carbon Black Formation During Thermal Pyrolysis and Diffusion Combustion. 15914-M

Mechanism of the Development of the Hemorrhagic Syndrome in Chronic Benzene Intoxication. 08826-F

Mechanism of the Diels-Alder Reactions of Butadiene. 07791-M

Mechanism of the High-Temperature Reactions Between C_2H_2 and Hydrogen. 05423-M

Mechanism of Photo-Oxidation in Smog. 05824-M

Mechanism of the Sulfonation Process. 15784-M

Mechanism of Sulfur-Alkylated Antagonism. 00745-M

Mechanism of the Vapor-Phase Nitration of Alkanes by Nitrogen Peroxide. 15238-M

Mechanisms of Air Pollution Reactions. 06301-D

Mechanisms of Coal Pyrolysis VIII---The Isothermal Disengagement of CO and CH_4 in the Range 570-670C. 10291-M

Mechanisms of Photochemical Reactions in Solution. XXXIX. Study of Energy Transfer by Kinetic Spectrophotometry. 15046-M

Mechanisms for Some High-Temperature Gas-Phase Reactions of Ethylene, Acetylene, and Butadiene. 07458-M

Medical Geology and Geography. 01071-P

Men With Intensive Occupational Exposure to DDT. 08320-F

Mercaptides of Cobalt, Nickel, Copper and Zinc. 04514-M

Merits of Liquefied Petroleum Gas Fuel for Automotive Pollution Abatement. 06104-B

Mesometeorological Classification System for Air Pollution Engineers. 11052-C

Meteorological Aspects of Air Pollution in Relation to Biological Responses. 00510-C

Meteorological Aspects of Atmospheric Pollution and Atmospheric Chemistry. 11004-C

Meteorological Aspects of Oxidation Type Air Pollution. 06045-C

Methane Composition of Urban Atmospheres. 01736-J

Methane Detection. 16567-D

Method and Apparatus for Testing Automotive Exhaust Gas. 14424-E

Method of Controlling Exhaust Emission. 13015-E

Method for Detecting Low Concentrations of Airborne Gaseous Contaminants. 11540-D

Method for the Detection and Isolation of Traces of Organic Fluorine Compounds in Plants. (Final Report). 00264-D

Method for Determination of the Total Amount of Combustible Organic Substances in Waste Gases With High Water Vapor Content. 13028-D

Method for Determining Organic Substances in Waste Gases. 14476-D

Method for Determining the Total Amount of Combustible Organic Substances in Waste Gases. 07692-D

Method for Gravimetric Trace Analysis of Hydrocarbon Vapors. 07373-D

Method for On-Site Determination of Residual Adsorptive Capacity of Charcoals Used in Closed Environmental System. 03185-D

Method of Reacting Aromatic Hydrocarbons. 15869-H

Method of Removing Nitrogen Oxides From Gases. 13554-E

Method for Sampling and Determining Heavy Hydrocarbons in Combustion Fumes. 11554-D

Method for Sampling and Determination of Organic Carbonyl Compounds in Automobile Exhaust. 08270-D

Method of Separating Sulphur Dioxide and the Like From Liquid Hydrocarbons. 15966-E

Methodologic Explorations in Experimental Respiratory Carcinogenesis. 08241-F

Methodology in Air Pollution Studies Using Irradiation Chambers. 07838-D

Methods for the Determination of Atmospheric Pollutants. 65951-D

Methods of Determination of Nitromethane and Nitroethane in the Air Production Installations. 15730-D

Methods for the Determination of Some Organic Atmospheric Air Pollutants. 05959-D

Methods for the Determination of Sodium and Butyl 2,4-Dichlorophenoxyacetates in Air. 08446-D

Methods for Determining Nitrogen Oxides in Automotive Exhausts. 10242-D

Methods for Estimating Oxides of Nitrogen Emissions From Combustion Processes. 04550-H

Methods of Evaluating the Exposure to Toxic Substances by Analysing the Metabolites in the Body. 13154-D

Methods of Generating Monodisperse Aerosols (Section II). 07272-H

Methods and Instruments Utilized at the F.R.I.F. Experimental Station for the Measurement of Diffusion Flames. 16365-D

Methods for Lowering Solvent Concentrations in the Air of Plants Engaged in Dry Cleaning Clothes. 04114-B

Methods of Measurement of Air Pollution. 03052-L

Methods of Measuring Air Pollution. Measurement of Hydrocarbons. (Part 5) 04210-D

Methods of Measuring Air Pollution (Report of the Working Party on Methods of Measuring Air Pollution and Survey Techniques). 01595-D

Methods of Reducing Pollution Caused by Internal Combustion Engines. 05172-B

Methods of Reducing Pollution Caused by Specific Industries 03129-B

Methods of Reducing Pollution Caused by Specific Industries (Chapter V. Oil Industry). 03129-B

Methods and Techniques Carried out in France in the Fight Against Atmospheric Pollution. 00455-C

3-Methyl-2-Benzothiazolone Hydrazone Test, Sensitive New Methods for the Detection, Rapid Estimation, and Determination of Aliphatic Aldehydes. 02097-D

Microchemical Pollutants in the Environment. 07599-A

Microdetermination of Caffeine Using the Ring Oven Technique. 00492-D

Microdetermination of Ozone in Smog Mixtures (Nitrogen Dioxide Equivalent Method). 03844-D

Microdetermination of Resin and Fatty Acids in Tall Oil. 13455-M

Microestimation of Benzo(a)-pyrene in Airborne Particulates and Air Pollution Source Effluents. 11091-D

Micro-Method for Rapid Tesing of Catalysts for the Oxidation of Combustible Gases. 05415-B

Middle Ultraviolet and Air Pollution. 07981-D

Military Procurement Problems Resulting From Air Pollution Controls. 14728-B

Mineral Components and 3,4-Benzpyrene in Air Pollutants of Tokyo. 00451-D

Minor Products of Combustion in Large Coal-Fired Steam Generators. 05011-B

Mist Removal From Compressed Gases. 00587-B

Mixed Informations. 16430-M

Mixture Pre-Treatment for Clean Exhaust--the Zenith "Duplex" Carburetion System. 09137-B

Mobile Test Station for Motor Vehicle Exhaust. 16170-D

Mode of Action of Some Toxic Substances With Special Reference to the Effects of Prolonged Exposure. 03702-F

Model Aerosols for Atmospheric Smog. 01587-C

Model Pyrolysis-the Study of Cellulose. 13668-B

Modern Approach to Air Quality in Workshops. 06677-L

Modified Method of Determining 3,4-Benzpyrene in the Atmosphere. 02581-D

Modified Total Combustion Analyzer for Use in Source Testing Air Pollution. 03965-D

Moisture Permeability of Polymers. I. Role of Crystallinity and Orientation. 15405-M

Molecular Association of Aromatic Hydrocarbons With Thionyl Chloride, Sulphuryl Chloride, and Sulphur Dioxide. 16052-M

Molten Salt Catalysts for Hydrocracking of Polynuclear Hydrocarbons. 04022-M

Monitoring of Contaminants, The First Step in Air Pollution Control. 05322-D

Monitoring Methane in Atmosphere With a Flame Ionization Detector. 01823-D

Morbidity and Mortality in Men Caused by Pulmonary Cancer and its Relation to the Pollution of the Atmosphere in the Areas of Aluminum Plants. 09244-F

More Letters in the Wind. 16318-B

Mortality From Pesticides in 1961. 01051-F

Motor Vehicles, Air Pollution and Health (The Schenck Act). 00052-B

Motor Vehicle Emissions and Their Effects. 05912-B

Motor Vehicle Emission Standards-Present and Future. 00157-L

Motor Vehicles Engines. 14725-E 08567-E

Motor Vehicle Exhaust Concentrations in a Road Tunnel. 05255-F

Motor Vehicle Exhaust Studies at Three Selected Sites. 01675-B

Motor Vehicle Pollution in California. 03944-E

Motor Vehicle Pollution Control. 03614-E

Multidimensional Chromatography of Arenes Produced During Combustion. 02495-M

Multiple-Chamber Incinerators for Burning Wood Work. 09825-B

Multiple Refrigerants in Natural Gas Liquefaction. 15134-M

Mylar Bags Used to Collect Air Samples in the Field for Laboratory Analysis. 03971-D

A-Naphthylamine and B-Naphthylamine in Cigarette Smoke. 15708-D

National Air Surveillance Network, Continuous Air Monitoring Program (1966 Data Tabulations and Summaries for Chicago, Cincinnati, Denver, Philadelphia, St. Louis, and Washington, D. C.). 06701-J

Natural Gas Challenges the Gas Industry. Part Two. 12085-B

Natural Gas and Clean Air. 08408-E

Nature and Control of Aircraft Engine Exhaust Emissions. 15399-B

Nature and Effects of Photochemical Air Pollutants on Man and Animal. I. General Characteristics and Community Concentrations. 04321-F

Nature of Some Model Photochemical Aerosols. 06102-M

Nature, Sources, and Fate of Air Contaminants. 00233-A

Nature of the Benzene-Soluble Fraction of Air Particulate Matter. 00293-D

Nature of Hydrocarbon Adsorption on Graphite, Oxides, Hydroxides, and Chemically Modified Surfaces. 14391-M

Nature of Polynuclear Aromatic Hydrocarbons in Air Particulates (A Report of Some Observations in the Sydney Area). 05501-D

Naval Research Laboratory (NRL) Total Hydrocarbon Analyser. 08519-D

Needs for New Instrumentation for Monitoring the Atmosphere for Organic Gases and Vapors. 02349-D

New Analytical Reagent for the Spectrophotometric Determination of Calcium (II). 2-chloro-5-cyano-3,6-dihydroxy-benzoquinone. 15278-M

New Atmosphere Irradiation Chamber. 03575-M

New Automobile Exhaust Analytical Train. 03267-D

New Color Reaction for Vapors of Certain Aromatic Hydrocarbons. 08490-D

New Colour Tests for the Larger Polynuclear Aromatic Hydrocarbons. 02037-D

New Data on Limits of Allowable Atmospheric Air Pollutants. 05940-L

New Developments in Chemical Carcinogenesis by Polycyclic Hydrocarbons and Related Heterocycles: A Review. 05284-F

New Developments in Hydrocarbon Gas Technology. 08476-E

New Distributing Injection System and its Potential for Improving Exhaust Gas Emission. 10539-E

New Instrumentation and Techniques for Pollution Monitoring. 04681-D

New Jersey Air Sanitation Program-A Review and Proposals for the Future. 00599-A

New Method of Detection of Glyoxal. 02079-D

New Method for the Photometric Determination of Primary Amines. 02843-D

New Method for the Spectrophotometric Determination and Characterization of N, N-Dialkylanilines, Diphenylamines and Carbazoles Using 5-Nitroisatin. 02078-D

New Methods for the Spot Test Detection and Spectrophotometric Determination of Formic Acid. 02080-D

New Photocolorimetric Method for the Determination of Naphthalene in Air. 06902-D

New Polynuclear Aromatic Compounds Showing Carcinogenic Activity. 01638-F

New Procedure Checks Vehicle Exhaust Emissions. 06809-K

New Process for Desulfurization of Hydrocarbons and Technical Gases. 15327-E

New and Revised Motor Vehicle Standards Adopted. 16518-L

New Simplified Detector for the Analysis of Organic Impurities in Atmosphere and Exhaust Gases. 05837-D

New Specific Analytical Procedure for the Detection and Characterization of 1,4-Naphthoquinones. 02081-D

New Studies on the Presence of Aromatic Polycyclic Hydrocarbons in the Atmospheric Dusts of the Historic Center of the City of Siena. 00936-J

New Techniques for Testing Trace Hydrocarbon Contamination of Gases. 02500-D

New Test for the Detection of Arakyl and Dialkyl Ketones Containing the (R-CH_2-) Grouping. 02708-D

Nitric Oxide Explosion. 13415-H

Nitric Oxide and Iodine Catalysed Isomerisation of Olefins. IV. Thermodynamic Data From Equilibrium Studies of the Geometrical Isomerisation of 1,3-Pentadiene. 01881-H

Nitric Oxide and Iodine Catalysed Isomerisation of Olefins. VI. Thermodynamic Data From Equilibrium Studies of the Geometrical and Positional Isomerisation of N-Pentenes. 00128-H

Nitrogen: Formation by Photooxidation of Ethylene in the Presence of its Oxides. 01244-C

Nitrogen Tetroxide Disposal Unit Combustion Products. 05849-B

Nitro-Olefins as Potential Carcinogens in Air Pollution. 00630-F

Non-Dispersive Infrared Gas Analysis With the Uson Apparatus. 08602-D

Non-Selective Collector for Sampling Gaseous Air Pollutants. (Final Report) 03425-D

November-December 1962 Air Pollution Episode in the Eastern United States. 00783-C

Nuclear Power and the Air Pollution Problem. 04492-B

Nuclear Submarine Atmospheres. Part 2. Development of Total Hydrogen Analyser (Interim Report). 15529-D

Nuclear Submarine Atmospheres. Part 3. Aromatic Hydrocarbon Content. 05042-D

Observations From a Ten-Year-Study of Pollution at a Site in the City of London. 04651-J

Occupational Factors in Carcinogenesis. 01762-F

Occurrence, Distribution, and Significance of Photochemical Air Pollution in the United States, Canada, and Mexico. 00229-G

Occurrence of Normal Paraffin Hydrocarbons in Nature (Tables & Bibliography). 02506-M

October 1965 New Orleans Asthma Study. 00638-F

Odor Threshold Determinations of 53 Odorant Chemicals. 14109-D

Odor Thresholds of Solvents for Assessment of Solvent Odors in the Air. 03773-D

Oil Burners for Domestic Applications: Present Design and Future Developments. 02001-B 04361-B

Oil Firing and Odour Problems. 10075-B

Oil Refining Tandem Pulls--- High Purity Aromatics From Coke-Oven Oil. 13553-M

Oil and Solvent Re-Refining. 09857-B

Oil-Water Effluent Systems. 09830-B

Olefin Isomerization in Adsorptive Sampling on Activated Carbon. 04547-D

Organic Fraction of Particulate Pollution, Including Polycyclic Hydrocarbons. 05502-D

Organic Halogen Compounds. 01765-B

Organic Lead-Cincinnati 1964. 01080-J

Organic Spectrophotometric Analysis-Review. 03523-D

Orientation Data for the Determination of Maximal Permissible Alpha-Methyl Styrol Concentration in the Air of Working Premises. 04111-F

Orientation Data for the Determination of Maximal Permissible DDT Concentration in the Air of Working Premises. 04107-F

Oscillatory Combustion at Elevated Pressure. 11263-B

Overall Kinetics of High Temperature Methane Oxidation in a Flow Reactor. 10048-M

"Oxidant" Air Pollutants as Phytotoxicants. 00009-G

Oxidant Plant Damage From Ozone-Olefin Reactions. 03595-G

Oxidation Catalysts. 13144-B

Oxidation of CO and Hydrocarbons Over Supported Transition Metal Oxide Catalysts. 14335-M

Oxidation of Gaseous Hydrocarbons in Concentrations of Parts Per Million in Flow Systems. Oxidation of 1-Butene in Type 410 Stainless Steel Tubes. 13034-M

Oxidation of Hydrocarbons on Simple Oxide Catalysts. 07607-M

Oxidation of Nitrogen During

Combustion of Methane-Nitrogen-Oxygen Mixtures, 14385-M

Oxidation of Soot by Hydroxyl Radicals, 04201-M

Oxidation of Unsaturated Hydrocarbons, 05058-M

Oxides of Nitrogen From Air Added in Exhaust Ports, 01884-E

Oxides of Nitrogen in the Atmosphere, 01572-B

Oxides of Nitrogen From Gas Turbines, 06435-D

Oxides of Nitrogen and Unburned Hydrocarbons Produced During Controlled Combustion, 03107-M

Oxygen Atom Reactions With Condensed Olefins, 07509-M

Oxygenated Solvents, Reformulating Nitrocellulose Lacquers, 12084-B

Ozone Analysis With the Mini-Adak II, 06050-D

Ozone Resistance Barrier Material, 03524-H

Ozonolysis, Evidence for Carbonyl Oxide Tautomerization and for 1,3-Dipolar Addition to Olefins, 00565-M

Ozonospheric Modification by Missile Exhaust, 06004-C

Paint Finisher and Air Pollution, 05471-B

Paper Chromatographic Identification of Carbonyl Compounds as Their 2,4-Dinitrophenylhydrazones in Automobile Exhaust, 01730-D

Paper and Thin-Layer Electrophoretic Separation of Polynuclear Aza Heterocyclic Compounds, 04528-D

Paramagnetic Resonance of Some Benzophenone Derivatives in Their Phosphorescent State, 07707-D

Parameters, 06712-A

Parameters of Aerometric Measurements for Air Pollution Research, 03520-D

Partial Combustion of Residual Fuels, 04668-M

Partial Oxidation Products Formed During Combustion, 05643-M 09046-M 10475-B

Partial Oxidation Products Formed During Combustion (Sixteenth Progress Report July 1 to Dec. 31, 1966), 02734-M

Particle Size Analysis of Paraffin Aerosols by Electron Microscopy, 02657-D

Particular Problems With Exhaust Gas Analysis at Volkswagenwerk AG, 14607-B

Particulate Air Pollutants Resulting From Combustion, 01798-D

Pathological Symptoms Due to Inhalation of Asbestos Dust, 10239-F

Patterns of Aerosol Particles Settling in Streamline Flow in a Straight Horizontal Tube, 02205-D

Perfluoroisobutylene and Hexafluoropropene Determination in Air, 02854-D

Performance of Anhydrous Ammonia as a Spark Ignition Engine Fuel, 02527-B

Performance of a Flue-Fed Incinerator, 07561-B

Periodic Acid, A Novel Oxidant of Polycyclic, Aromatic Hydrocarbons, 11147-M

Permeation, Diffusion, and Solubility of Methyl Bromide and Isobutene in Polyethylene, 15032-M

Permeation of Gases Through Polyethylene Films at Elevated Pressures, 15074-M

Pesticides, 07964-F

Pesticides Poisoning: The Insecticides, 06219-F

Petroleum Asphalt Inhalation by Mice, 08015-F

Petroleum Refining Industry, Air Pollution Problems and Control Methods, 01620-B

Philips-Stirling Engine, 15243-M

Philosophy of Establishing Air Quality Criteria as Guides for the Setting of Air Pollution Control Standards in the United States, 07601-L

Photoactivation of Polynuclear Hydrocarbons, 00663-F

Photochemical Air Pollution Damage to Plants, 03615-G

Photochemical Addition of Hydrogen Bromide to 2-Butene in the Gas Phase, 02258-M

Photochemical Aerosol Formation in Sulfur Dioxide-Hydrocarbon Systems, 07108-M

Photochemical Air Pollution Syndrome as Exhibited by the Attack of October 1965, 00502-C

Photochemical Aspects of Air Pollution: A Review, 00757-C

Photochemical Changes in Thin Layer Chromatograms of Polycyclic, Aromatic Hydrocarbons, 06955-D

Photochemical Effects of Nitrogen Oxides, 01575-B

Photochemical Measurements of Ultraviolet Sunlight, 01027-C

Photochemical Oxidation of Benzo(a)pyrene, 02853-M

Photochemical Oxidations, I. Ethyl Iodine, 03488-M

Photochemical Oxidations, II. Methyl Iodide, 04503-M

Photochemical Oxidations, III. Acetone, 02534-M

Photochemical Oxidations, IV. Acetaldehyde, 02535-M

Photochemical Reactions of Alpha, Beta-Unsaturated Carbonyl Compounds With Olefins, 07510-M

Photochemical Reactivities of Exhausts From 1966 Model Automobiles

Equipped to Reduce Hydrocarbon Emissions. 05553-G

Photochemical Reactivity of Solvents. 08558-M

Photochemical Studies in Rigid Matrices. II. A Study of the Photochemical Reactivity of Anthracene in Polystyrene and the Development of an O-Nitrobenzaldehyde Actinometer in Polymethylmethacrylate. 10519-M

Photochemical Reaction Products in Air Pollution. 05618-G

Photochemical Reactivity of Trichloroethylene and Other Solvents 15354-D

Photochemical Studies of Air Pollution. II. Studies on Photochemical Products of Auto Exhaust. 15911-M

Photochemical Studies in an Alkali Halide Matrix. I. 01210-M

Photochemical Transformation of a Beta, Gamma Epoxy Ketone. 00355-M

Photochemically Induced Reactions of Acetylenes With Aromatic Compounds. 01194-C

Photochemistry of 2-Alkylaminophenoxas-3-ones. 01186-M

Photochemistry of the Azoalkanes. 11239-M

Photochemistry of Gamma-Butyrolactone in the Liquid Phase. 10512-M

Photochemistry of Heterocyclic Compounds (a Literature Survey). 04285-M

Photochemistry of Ketones and Aldehydes. 12169-M

Photochemistry of the System Ketene-NO-H_2. 09078-M

Photochemistry of Unsaturated Carbonyl Derivatives and Related Small Ring Systems. (Final Rept. July 1, 1963--Dec. 31, 1965.) 02445-M

Photochemistry of Unsaturated Systems Containing Hetero Atoms Other Than Oxygen. 03009-M

Photocyclization of 3,3-Dimethyl-1-Phenylbutene-1, A Novel Photoinduced 1,2-Methyl Migration. 00356-M

Photodynamic Bioassay of Polycyclic Air Pollutants. 02169-J

Photodynamic Bioassay of Polycyclic Atmospheric Pollutants. 01302-D

Photoelectrocolorimetric Determination of Higher Aliphatic Amines in Air. 03037-D

Photoelectrometric Method for the Determination of Low 3,4-Benzpyrene Concentrations. 04085-D

Photoelimination of Ethylene From 2-Pentanone. 01233-M

Photodynamic Bioassay of Benzo(a)pyrene With Paramecium caudatum. 01025-P

Photoinitiation of Unimolecular Reaction. The Photolysis of 2,5-Diazabicyclo (2,2,1) Hept-2-ene. 02528-M

Photoionization Resonance Spectra. I. Nitric Oxide and Benzene. 14293-M

Photolysis of 1,1-Azo-n-butane Vapor: the Reactions of the N-Butyl. 01648-M

Photolysis of 1,1-Azoisobutane Vapor at 3660A; the Reactions of the Isobutyl Free Radical. 07512-M

Photolysis of CH_2 at 470 A. 03184-M

Photolysis of Cyclobutane at Photon Energies Below and Above the Ionization Energy. 04456-M

Photolysis of Cyclopentane at 1470, 1236, and 1048-1067 A. 00269-M

Photolytic Degradation as a Means of Organic Structural Determination. 08105-M

Photolytic Desulfurization of Dibenzothiophene Episulphide. 00353-M

Photolytic Processes in Perfluorocyclobutanone Vapor. 02337-M

Photooxidation of Nitrogen Dioxide Mixtures in Air. 01825-G

Photooxidation of 1,1-Azoisobutane: The Reactions of the Isobutyl Free Radical With Oxygen. 11248-M

Photooxidation of Butene-1 by Nitrogen Dioxide at Short Wave-Lengths. 09079-M

Photooxidation of Diethyl Ketone Vapor. 08353-M

Photooxidation of Hydrocarbons. 01747-M

Photooxidation of Hydrocarbons in the Presence of Aliphatic Ketones. 05333-M

Photooxidation of Perfluoromethyl Iodide and Perfluoro-n-propyl Iodide. 02317-M

Photooxidation of Propylene With Nitrogen Oxide in the Presence of Sulfur Dioxide. 08845-M

Photoreduction of 2,2-Diphenyl-1-Picrylhydrazyl (DPPH) in Hydrocarbons. 02406-M

Physicochemical Mechanism of Natural Gas Combustion. 14379-M

Physicochemical Studies of Mol/Odena Re-Forming Catalysts. 16608-M

Physiological and Biochemical Effects of Atmospheric Oxidants on Plants. 00950-G

Physiological Responses of Plants to Air Pollutants. 03629-G

Pilot Study of Ultraviolet Radiation in Los Angeles, October 1965. (A Report on Concurrent Measurements Made by Cooperating Organizations by Various Methods. 01461-G

Plant Damage by Air Pollution. 03516-G

Plant Damage and Eye Irritation From Ozone-Hydrocarbon Reactions. 05680-P

Plant Damage: An Indicator of the Presence and Distribution of Air Pollution. 02209-G

Plant Damage by Pollution Derived From Automobiles. 03506-G

Plant Damage Caused by Irradiation of Aldehydes. 00961-G

Plant Injury Induced by Photochemical Reaction Products of Propylene-Nitrogen Dioxide Mixtures. 05610-G

Plant Response to Polluted Air. 05724-G

Plastic Bags for Collection of Gas Samples. 01876-D

Plastic Containers for Sampling and Storage of Atmospheric Hydrocarbons Prior to Gas Chromatographic Analysis. 00584-D

Platinum Oxidation Catalysts in the Control of Air Pollution. 04558-E

Pneumonia Due to Liquid Paraffin: With Chemical Analysis. 07342-F

Pneumatic Fuel Atomization as Applied to Automobile Air Pollution Control. 00057-E

Poisoning From Chlorinated Hydrocarbon Solvent. 04124-F

Policies on the Prevention of Air Pollution Due to Automobile Exhaust Gas. 02142-E

Polluted Air. Origin, Medical Significance and Combating of Polluted Outside Air. 16345-F

Polluted Air Production With Gaseous Particles. 12949-H

Polluted Urban Air and Related Environmental Factors in the Pathogenesis of Pulmonary Cancer. 08243-F

Pollution of the Air by Automobile. Evolution of the Formulation of the Rules of the European Plan. Comparison of Limits Anticipated in Europe and the U.S.A. 14842-L

Pollution by Air by Synthetic Fatty Alcohols Around a Factory Producing Fat Substitutes. 02548-B

Pollution of Air by a Synthetic Rubber Plant. 03030-J

Pollution Control at Ferndale, Washington. 03804-E

Pollution by Exhaust: U. S. Law and a U. K. System. 04659-E

Pollution in Road Tunnels. 15769-B

Pollution by Polycyclic Aromatic Hydrocarbons in the City of Sydney. 05675-J

Polycyclic Aromatic Hydrocarbons From Diffusion Flames and Diesel Engine Combustion. 01008-B

Polycyclic Hydrocarbons of Carcinogens for Man. 01968-F

Polycyclic Hydrocarbon Elution From Carbon Black or Rubber Products. 04706-F

Polycyclic Hydrocarbon Ratios: Their Use in Studying the Sequence of Combustion in a Hand-Fired Intermittent Brick Kiln. 02023-B

Polyneuritis After Occupational Contact With DDT. 07956-F

Polynuclear Aromatic Hydrocarbon Composition of the Atmosphere in Some Large American Cities. 02044-J

Polynuclear Aromatic Hydrocarbons Associated With Particulates in Pittsburgh. 00727-J

Polynuclear Aromatic Hydrocarbon. Composition of Air Polluted by Coal-Tar Pitch Fumes. 02226-D

Polynuclear Aromatic Hydrocarbons in Urban Atmospheres in Ontario. 00689-J

Polynuclear Azo Compounds in Automotive Exhaust. 00870-F

Polynuclear Hydrocarbon Emissions From Selected Industrial Processes. 00621-B

Polystyrene Aerosols-- Electrical Charge and Residue Size Distribution (Section III.). 07273-M

Polysulfones From Acetylenes and Sulfur Dioxide. 15970-M

Portable Detector for Mixed Hydrazines Propellant Fuel Vapors at Low Concentration. 04440-D

Possible Contamination of Chemical Products With 3,4-Benzpyrene During Their Manufacture. 03935-B

Possibilities of Decontaminating Exhaust Gases of Otto Engines. 00260-

Possibility of Automobile Air Pollution Control by Low Pressure Petrol Injection System. 15895-E

Potential of Modifications to the Engine Induction System on Performance and Emissions. 01328-B

Potentialities of Emission Reduction by Design of Induction Systems. 01871-E

Potpourri That is Exhaust Gas. 01384-B

Preliminary Meteorological Analysis of National Air Sampling Network Data, Vol. II. Comparison and Interpretation of Results. 02551-J

Preliminary Observations on the Relationship Between Eye Irritation in Synthetic Systems and in the Atmosphere. 01596-F

Preliminary Results of Toxicity Studies in 5 PSIA 100% Oxygen Environment. 03820-F

Preliminary Studies on Light-Induced Carbon Monoxide in Closed Environments. 02472-M

Prepared Discussion: Air Pollution on Lung Cancer. 04590-F

Presence of Carcinogenic Substances and 3,4-Benzpyrene in Particular, in the Environment of Man. 07301-F

Presence of Oxidants in the Atmosphere of Certain Towns in the U.S.S.R. 07830-D

Present Day Conditions of Atmospheric Air Pollution by Automobile Exhaust Gases in Cities and Problems of its Control. 08165-B

Present Status of Air Pollution. 04212-A

Present Status of Air Pollution in Cities and Towns. 07303-J

Present Status of Atmospheric Pollution in the United States. 03085-A

Present Status of Exhaust Gas Control in the DDR (East Germany). 10553-E

Pressure-Broadening Effects on Infrared Peak Intensities of Hydrocarbons. 03448-D

Pressure Relief and Blowdown: Fundamentals of Engineering Offsites and Utilities for the IPI (Part 6). 06159-E

Prevention of Air Pollution by Fumes From Baking Finishes. 02112-E

Prevention of Atmospheric Pollution in Petroleum Refineries. 14798-B

Primate, Canine and Rodent Tracheobronchial Epithelial Response to Polycyclic Hydrocarbons and Air Pollutant Extracts in Organ Culture: A Progress Report. 11209-F

Problem of Cancer in New Zealand. 07150-F

Problem of the Carcinogenicity of Atmospheric Pollutants. III. The Radioactive Tracer Technique for the Quantitative Determination of Aromatic Polycyclic Hydrocarbons. 15703-D

Problem of Hygienically Permissible Limiting Concentrations of Air Pollution. 00411-L

Problem of Limiting Emission of Toxicants by Motor Vehicles in Europe. 14475-L

Problem of Removing the Carcinogenic Properties of Brick Coal. 02600-E

Problematics Concerning the Determination of Benzpyrene in Atmospheric Air. 06634-D

Problems of Air Pollution in Plant Pathology. 05344-G

Problems of Air Pollution due to Vehicle Emission Gases. 06144-E

Problems of Basic Urban Air Pollution. 03202-B

Problems of Exhaust Gases From Otto Engines: Results of Other and Original Measurements. 15367-B

Problems and Methods of Solution of Eliminating Noxious Substances From Internal Combustion Engines. 08803-L

Procedures in Sampling and Handling Auto Exhaust. 01260-D

Process for Disposal of Chlorinated Organic Residues. 04535-E

Process for Removing Organic Contaminants From Air. 13217-E

Process for Separating Acidic Gases. 15090-E

Process for the Separation of Acidic Gases From Fluids. 15861-E

Process of Purifying Gases, Especially Synthesis- and Semi-Gases. 15778-E

Processes for Removing Stilbene From Tall Oil Fatty Acids. 13465-H

Production of Lung Cancer in Mice by Inhalation Exposure to Influenza Virus and Aerosols of Hydrocarbons. 01015-F

Production of Pure Peroxyacyl Nitrates. 00238-H 05292-G

Products and Biological

Effects From Irradiation of Nitrogen Oxides With Hydrocarbons or Aldehydes Under Dynamic Conditions. 01401-F

Products of Combustion of Gaseous Fuels. 04095-B

Program Development Through Applying Measurements and Monitoring Know-how. 04506-D

Progress in Medical Research on Air Pollution. 00281-F

Progress in the Prevention and Control of Air Pollution. First Report of the Secretary of Health, Education, and Welfare to the United States Congress. 10205-E

Progress Report on the Chemistry of Community Air Pollution. 01501-F

Progress Report on the Development of Exhaust Manifold Reactors. 11548-E

Progress Report: Formation Standards for Trace Gas Analysis. 11270-D

Progress Report on the Photochemistry of Polluted Atmospheres. 01605-F

Project of Normalized Method for Determination of Vapors of Benzyl Chloride in Air. 15749-D

Project Stratofire. 04015-E

Propagators for Alternant Hydrocarbon Molecules. 04409-M

Proposed New Sanitary Standards for Projected Industrial Production Plants. 07289-L

Prospects for Exhaust Control by Engine Modification. 05822-E

Protection of City Air From Motor Vehicle Exhaust Gases. 16444-E

Protective Coatings and Rain 66. 05106-B

Products of the Common Influence of Sulfur Dioxide and Chlorine on Aliphatic Hydrocarbons in Ultraviolet Light. IV Part: The Products of the Common Influence of Sulfur Dioxide and Chlorine on N-Dodecane. 16605-M

Properties of Diffusion Coefficients in Polymers. 15151-M

Proton Magnetic Resonance Analysis of Gasolines. 08316-D

Psychophysiological Testing of Human Subjects Exposed to Solvent Vapors. 05418-F

Public Health Aspects of Air Pollution From Diesel Vehicles. 16024-B 07506-B

Public Health Aspects of Increasing Tetraethyl Lead Content in Motor Fuel. 07270-F

Public Nuisance Due to Organic Solvents and Propane Gas (LPG). 14494-F

Pulmonary Neoplasms Produced by Methylcholanthrene in the White Pekin Duck. 06266-F

Pulmonary Toxicological Manifestations of Terpene Particles. 09002-F

Pulse-Sampling Technique for the Study of Electron-

Attachment Phenomena. 00119-M

Pumps. 00840-B

Purification of Air Polluted by Vapors and Gases. 00162-E

Purification of Hydrocarbon-Sulfur Dioxide-Chlorine Reaction Products. 15990-M

12-Pyridylbenz(a)anthracenes. 01635-M

Pyrolysis of Refuse Components. 07882-E

Quality of Atmospheric Air in the Vicinity of Petroleum Refinery Plants. 07304-J

Quality Control Aspects of Chrysler's Cleaner Air System. 16361-D

Quality Standards for Air and Water. 01270-J

Quantitative Analysis of Polyvinylpyrrolidone in Atmosphere Samples and Biological Tissues. 01049-F

Quantitative Composition of Air Pollution Source Effluents in Terms of Azo Heterocyclic Compounds and Polynuclear Aromatic Hydrocarbons. 00025-J

Quantitative Composition of the Urban Atmosphere in Terms of Polynuclear Azo Heterocyclic Compounds and Aliphatic and Polynuclear Aromatic Hydrocarbons. 00031-D

Quantitative Determination of Benzene, Toluene, and Xylene in Solvent and in Air by Gas-Chromatography. 04145-D

Quantitative Determination of Carcinogenic Hydrocarbons Through Fluorescent Spectrophotometry. 15977-D

Quantitative Determination of Benzo(a)pyrene in the Air of South African Cities. 01356-D

Quantitative Determination of Low 3,4-Benzpyrene Concentrations With Fine Structure Fluorescent Spectrum. 00662-D

Quantitative Hydrocarbon Gas Analyses Using Alumina-Packed Glass Capillary Columns. 12665-D

Quantum Mechanics of Activated Adsorption. 14258-M

Quenching of the Triplet State of Acetone and Biacetyl by Various Unsaturated Hydrocarbons. 01824-M

Quenchofluorometric Analysis for Polynuclear Compounds. 00770-M

Quenchophosphorimetric Analysis for Conjugated Compounds. 00386-D

Quick Measure of Jet Fuel Properties. 10428-B

Radioactive Neutlogarse Test Aerosols and Lung Clearance. 01805-F

Radiation-Induced Oxidation of Hydrocarbons. 04454-M

Radiotracer Study of the

Production of Formaldehyde in the Photooxidation of Ethylene in the Atmosphere (Part II--the Effect of Other Compounds on Yield and Conversion). 05011-H

Range of Applicability of Catalytic Flame Burners. 07020-E

Rankine Cycle Working Fluid Selection and Specification Rationale. 14145-H

Rapid Continuous Determination of Nitric Oxide Concentration in Exhaust Gases. 00455-D

Rapid Determination of Small Quantities of Dimethylaniline in the Air. 00171-D

Rapid Estimation of 7H-Benz(de)anthracen-7-one and Phenalen-1-one in Organic Extracts of Airborne Particulates From 3-Hour Sequential Air Samples. 15337-D

Rapid Gas Chromatographic Determination of C_1 to C_{10} Hydrocarbons in Automotive Exhaust Gas. 01228-D

Rapid ITIC Fluorimetric Methods for the Assay of Phenalen-1-one and 7H-Benz(de)anthracen-7-one in Polluted Urban Atmospheres. 09597-D

Rapid Method for the Determination in Atmospheric Dust. 09225-D

Rapid Methods for the Determination of Harmful Gases and Vapors in the Air. 02430-D

Rapid Methods for the Determination of Tertiary Fatty Alcohols, Lower Ketones and Xylenes in Air. 04254-D

Rapid-Response Total Exhaust Hydrocarbon Detector. 02358-D

Rapid and Sensitive Colorimetric Reagent for Nitrogen Dioxide in Air. 03096-D

Rapid Survey Technique for Estimating Community Air Pollution Emissions. 00536-E

Reaction of Active Nitrogen With Mixtures of Ethylene and Nitric Oxide. 05226-H

Reaction Bad Odor Substances With Ozone. 15772-E

Reaction Between O(3P) and Condensed Olefins Below 100 deg K. 07408-H

Reaction Between Sulfur Dioxide and Olefins. III. Higher Olefins and Some Limitations of the Reaction. 16083-H

Reaction Kinetics in Diesel Combustion. 04621-E

Reaction of Nitric Oxide With 1,3- and 1,4-Cyclohexandienes. 05435-H

Reaction of Oxygen Atoms and Ozone in Air Pollution. 02476-C

Reaction of Sulfur Dioxide With Diolefins and Separation of Latter From Hydrocarbon Mixtures. 15846-H

Reactions of Atomic Oxygen With Acetylene (I) Kinetics and Mechanism. 00161-H

Reactions of Auto Exhaust in Sunlight. 05817-C

Reactions of Methyl Radicals in the Solid-Liquid-, and Gas-Phase Photolysis of

Dimethylmercury. 01143-M

Reactions of Sulfur Containing Hydrocarbons in an Electrical Discharge. 10945-E

Reactions of Sulfur Trioxide, and of its Adducts, With Organic Compounds. 15805-M

Reactivity of Aromatic Hydrocarbons in Irradiated Automobile Exhaust. 01815-B

Reactivity of Excited States. Intramolecular Hydrogen Atom Abstraction in Substituted Butyrophenones. 00910-M

Reactivity of Organic Substances in Atmospheric Photooxidation. 00109-B

Realistic Vehicle Emission Inspection System. 10002-B

Recent Aerosol Research: University of Minnesota. 00445-D

Recent Development in the Study of the Organic Chemistry of the Atmosphere. 05818-C

Recent Occupational Health Experiences in Ontario. 05737-F

Recombination of Ions in Flames Effect of Temperature. 05043-M

Recommendation for Allowable Concentration (1966). 07197-L

Recommended Procedures for Measuring Odorous Constituents in the Field. 00056-D

Reconsideration of Some Significant Aspects of the Cigarette Smoking Lung Cancer Controversy. 07281-F

Recording of O and its Dependence on Traffic and Wind. 07366-J

Recovering Hydrogen Chloride and Sulphur Dioxide From Gas Mixtures. 15095-E

Recovery of Organic Solvent From Polluted Air. 02764-E

Recovery of Sulphur Dioxide and Dolofins From Sulphones. 15837-E

Reducing the Emission of Small Oil-Firing Units With Special Emphasis on Control Methods. 02075-E

Reduction of Air Pollution by Control Emission From Automotive Crankcases. 03580-B

Reduction of Carcinogenic Contaminants in Exhaust Gases of Petrol Engines Through Fuel Additives and Choice of Lubricants. 02048-D

Reduction and Problems of Air Pollution in Great Britain 1958 to 1970. 07045-B

Refining to Produce Gasolines of Reduced Lead Content. 03280-I

Reflective Effects of Micro-Concentrations of Benzene, Toluene, Xylene and their Comparative Assessment. 06805-F

Refractive Index of Freon 12. 00116-M

Regeneration of Absorbent. 15872-M

Regional Aerosol Deposition in the Human Respiratory Tract. 07027-F

Regulation 3, 03554-E

Regulation of Air Pollution From Power Plants in the United States, 01654-B

Regulation of New Motor Vehicles, 08075-E

Relation of Odor Flow Rate and Duration of Stimulus Intensity Needed for Perception, 08017-F

Relation of Plant Damage to Pool Composition, 05103-G

Relations Between Atmospheric Pollution in Urban and Rural Localities and Mortality From Cancer, Bronchitis and Pneumonia, With Particular Reference to 3;4 Benzopyrene, Beryllium, Molybdenum, Vanadium and Arsenic, 03086-F

Relations Between Photo Composition Modes and Molecular Structure in the Series of Carbonyl Compounds, N-C@O (IR, 01640-G

Relations Between Physico-Chemical Properties of Hydrocarbons and their Toxicity, 13933-N

Relationship Between Motor Traffic Density and Air Pollution in a Metropolitan Street, 15575-J

Relationship of River Water Odor to Specific Organic Contaminants, 07085-B

Meteorological Factors and Photochemical Smog, 00618-G

Relative Reactivity of Hydrocarbons in Photochemical Smog Formation and its Practical Implications, 00344-G

Reliability of Measurement of Evaporated Benzene Homologue Concentrations With the Benzene-Detection Tube, 04742-D

Removal of Organic Contaminants From Air by Type 13_X Molecular Sieve, 00103-H

Report to the Legislature on Air Pollution in Colorado, 01010-J

Report on the Results of Investigation of the Effects of Automobile Exhaust on the Human Body, 03214-F

Requirements for Safe Discharge of Hydrocarbon to Atmosphere, 03675-G

Research on the Alicyclic Series, Study of the Organo-Magnesium Compounds, (6th Report), 16611-M

Research and Development Study Related to the Synthesis of Formaldehyde From CO_2 and H_2, 04288-M 04289-M

Research on the Mechanism of Thermal Decomposition of Hydrocarbon Fuels, 06997-M

Research on New Techniques in Absorption and Emission Spectroscopy (Quarterly Progress Report), 01205-D

Resin Dermatitis in a Car Factory, 01351-E

Resolution of Complex Hydrocarbon Mixtures by Capillary Column Gas Chromatography Composition of the 80 Degrees 180 Degrees C Aromatic Portion of Petroleum, 07395-M

Respiratory Deposition of Polystyrene Aerosols in Man, 08485-F

Respiratory Hazards Associated With Toluene Di-Isocyanate

in Poly-Urethane Foam Production. 07165-F

Response of Enzyme Systems to Photochemical Reaction Products. 00658-F

Response of Plants to Air Pollution. 03617-G

Responses of Electron-Capture Detector to Halogenated Substances. 01812-D

Results of a Health Examination on Benzene Workers and the Effect of Thiouric Acid. 04142-F

Retention Rate of Particulate Carcinogens in the Lungs. 00842-F

Review of Air Force Data From Long Term Continuous Exposure at Ambient Pressure. 03821-F

Review of Ambient Pressure Animal Exposure Data From Selected Navy Compounds. 03822-F

Review of Chemical Mutagenesis. 12175-F

Review of Oxidation of Polycyclic, Aromatic Hydrocarbons. 00058-M

Review of Pitfalls and Past, Current and Future Research in the Field of Air Pollution Health Effects. 00010-F

Rising Tide of Air Pollution. 05805-J

Role of the Catalyst in the Reaction of Alcohols and Hydrogen Sulfide. 12172-M

Role of Engine Blowby in Air Pollution. 03502-B

Role of Optics in Air Pollution Monitoring. 09111-D

Role Played by Paraffin the Blastomogenicity of Crude Oil. 04170-F

Role of N_2O, CH_4 and O_3 in Atmospheric Absorption in the Infrared. 15729-G

Role of Oxygen Atoms in the Atmospheric Reaction of Olefins With Nitric Oxide. 02851-M

Role of the Scientist in Urban Ecology. 11152-B

Roles of Molecular Structure and Environment in the Reactivity of Excited States. 00925-M

Rotating-Slit Aerosol Spectrometer (ROSL-Spectrometer): Prototype. 09738-D

Routine Determination of Polycyclic Hydrocarbons in Airborne Pollutants. 07427-D

Rule 66 : a Part of Total Air Pollution Control. 08554-E

Safe Use of Pesticides in Public Health. 09090-F

Safety and Ventilation. 13050-D

Sample Collection Techniques for Combustion Sources - Benzopyrene Determination. 02233-D

Sampling and Analysis. 11165-D

Sampling and Analysis of Aromatic Hydrocarbon Vapors in Air: A Gas-Liquid Chromatographic Method. 07061-D

Sampling and Analysis of Organic Solvent Emissions. 08290-D 08848-D

Sampling and Mass Spectrometer Analysis of Reaction Products From the Photochemical Decomposition of Various Olefins. 01304-D

Sanitary Clearance Zones Between Residential Sections and Places of Fuel Storage in Storehouses of Saratovsk (Oblast) Territory. 08106-J

Sanitary Protection of Moscow Atmospheric Air. 05261-J

Sanitary and Toxicological Characteristics of the Effect of a Mixture of Benzene and Acetophenone Vapors in the Atmosphere. 08431-F

Scientific Approach to the Problem. 05573-D

Scientific Methods and Techniques to Decrease the Pollution of the Environment Through Intuition of Inspection, and of Acoustical "Hallucose". 03541-H

Scrubbing Devices For Air Pollution Control. 03672-H

Sealed Environments in Relation to Health and Disease. 00538-H

Search for Some Nitro-Olefins in Polluted Air. 03112-D

Secondary Anemia and Susceptibility to Hydrogen Combustion Products. 05720-F

Sebor: Preliminary Engineering Design and Cost Estimates for Steam Stripping Kraft Pulp Mill Effluents. 08565-H

Sebor I: Volatile Organic Compounds in Kraft Pulp Mill Effluent Streams. 05409-H

Selected Methods for the Measurement of Air Pollutants. 00845-D

Selection of Air Filter. 06793-H

Selection of Air Intake Points for Ventilation of Premises in Petroleum Processing Plants. 08106-J

Selective Combustion Analysis and Application to Auto Exhaust. 14525-D

Selective Photochemistry of Bromine Using a Ruby Laser. 15109-H

Semi-Automatic Gas Chromatograph for Determining N-Paraffins and Hydrocarbon Types in Gasoline. 01503-D

Seminar of Air Pollution by Motor Vehicles. 00186-H 01488-H 05007-H 16263-H

Sensitive New Methods for Autocatalytic Spectrophotometric Determination of Nitrite Through Free-Radical Chromogens. 03083-H

Sensitive New Method for the Determination of Nitrites and Nitrogen Dioxide With 4-Aminoazobenzene-1-Naphthylamine. 02799-D

Sensitive New Procedure for the Analysis of Aliphatic, Aromatic and Heterocyclic Aldehydes. 00817-D

Separating Fact From Fiction in Auto Smog Control. 00504-H

Separation of Aliphatic Disulfides and Trisulfides by Gas-Liquid Partition Chromatography. 13063-H

Separation and Analysis of Polynuclear Aromatic Hydrocarbons Present in the Human Environment. 03080-D

Separation and Characterization of Polynuclear Aromatic Hydrocarbons in Urban Air-Borne Particulates. 02237-D

Separation and Determination of Aliphatic Alcohols in Air by Paper Chromatography. 06903-D

Separation of Gaseous Mixtures Using Porous Polyaromatic Polymer Beads. 15803-D

Separation and Identification of Phenols in Automobile Exhaust by Paper and Gas Liquid Chromatography. 00911-D

Separation and Identification of Polycyclic Hydrocarbons in Rubber Dust. 10767-D

Separation of Pyrenedienes by Column Chromatography. 06980-H

Separation of Sulphur Dioxide and Low-Boiling Hydrocarbons From Mixtures Thereof. 15875-D

Shock Tube Study of Methane Oxidation. 13931-H

Short-Term Lung Clearance in Rabbits Exposed to a Radioactive Bi-Disperse (6 and 3 micron) Polystyrene Aerosol. 00484-D

Significance of the Adrenals in the Effect of Methane-Oxygen Hypoxic Gas Mixtures. 13960-F

Simple Flow-Volume Device for Measuring Ventilatory Function in the Field. Results on Workers Exposed to Low Levels of Toluene Diisocyanate. 12955-F

Simple Measuring Arrangement for Recording Hydrocarbon Content. 08757-D

Simple Photodynamic Assay for Polycyclic Atmospheric Pollutants. 00738-D

Simplified Equilibrium Hydrocarbon Air Combustion Gas Model for Convenient Use in Air-Breathing Engine Cycle Computer Programs. 16023-H

Similarity Between the Electrochemical Elimination of Sulphur From Coal and From Dibenzothiophene. 10030-H

Simple Sensitive Test for Compounds Containing the Cyclopentadiene CH2 Grouping. Application to Air Pollution. 02801-D

Simple Specific Test for Inner--Ring O-Quinones. 02083-D

Simultaneous Determination of Lead Alkyls and Halide Scavengers in Gasoline by Gas Chromatography With Flame Ionization Detection. 01230-D

Simultaneous Microdetermination of Carbon, Hydrogen, and Uranium. 15305-H

Singlet Oxygen in the Environmental Sciences: The Role of Singlet Molecular Oxygen in the Production of Photochemical Air Pollution. 07257-C

Size Determination of Atmospheric Sulfate and Organic Particulates. 01592-D

Sizing Up Anti-Pollution Legislation. 08463-K

Slag Heaps as a Source of Atmospheric Pollution. 02540-B

Smog Abatement. 05149-E

Smog: The Deadly Poisons Peril Life in all City Areas. 05313-B

Smog - Its Origin. 00165-F

Smog: The Silent Enemy. 00281-E

Smog Tune-up for Older Cars. 10132-B

Smogless Automobile. 05833-E

Smoke and Air Pollution - New York - New Jersey. 03454-J

Solubility of Gases in Polyethylene. 15141-H

Solubility of Vapors in Gases. 15744-H

Solution of Gases in Polyethylene Terephthalate. 15183-H

Solvent Control - A National Problem. 00134-E

Solvent Emission Control Laws and the Coatings and Solvent Industry. 00751-B

Solvent Extraction. 13571-H

Solvent Selection for the Reduction of Air Pollution. 10060-B

Solvent and Temperature Effects in the Photoreduction of Ketones. 00081-H

Solvents, Dyes and Rule 66. 08376-B

Some Aspects of Atmospheric Chemical Reactions in Atomic Oxygen. 03064-C

Some Aspects of the Physical and Chemical Nature of Air Pollution.

Some Correlations Between Spectroscopic and Photochemical Processes. 00802-C

Some Implication of Ambient Air Quality Standards. 01955-L

Some Laboratory and Epidemiological Aspects of Air Pollution Carcinogenesis. 01286-F

Some New Alkyl 1,2,3,4-Dibenzopyrenes. 01631-H

Some Observations on the Kinetics of Hydrogen [illegible] 1,3-and 1,6-Pentadiene. 07663-H

Some Rectification of Air Contamination. 00160-F

Some Remarks on the Nitric Oxide--Nitrogen Dioxide Conversion. 04033-H

Some Results of the Investigation of Air Pollution Caused by Road Traffic. 10440-J

Some Results of Multiple-Tracer Diffusion Experiments at Cincinnati. 04033-C

Some Toxic Effects of Air Pollution on Public Health. 03556-A

Soot Formation in Ethylene and Propane Diffusion Flames. 11145-B

Soot Formation Tendency of LP-Gas in Atmospheric Burners. 14074-B

Soot-Free Combustion of

Petrochemical Waste Gases. 06127-E

Soot Hazards Investigated From Their Carcinogenic Aspects. 08350-F

Source Inventory IBM System for Particulate and Gaseous Pollutants. 00557-B

Source and Kinds of Contaminant From Motor Vehicles. 01614-B

Source Testing Manual 03010-D

Sources and Distribution of Air Pollution Ascertained by Stationary Recording of Gaseous Components. 02066-B

Sources of Polynuclear Hydrocarbons in the Atmosphere. 05005-B

Southern California Aerospace Industry's Program to Control Smog Produced by Chemical Milling Maskants and Spray Protective Coatings. 08553-B

Space Cabin Toxicology. 10613-F

Spark Ignition Engine Operation and Design for Minimum Exhaust Emission. 00597-B

Special Industrial Processes. 07025-B

Specific Spectrophotometric Determination of Ozone in the Atmosphere Using 1,2-Di-(4-Pyridyl) Ethylene. 00614-D

Specificity of Catalysts for the Oxidation of Carbon Monoxide Ethylene Mixtures. 04791-E

Spectral Characterization of Nitroarenes and Polycyclic Aldehydes, Ketones, Quinones, and Amines. 01696-D

Spectrofluorometric Method for Determination of 3,4-Benzpyrene in Benzene Solution Contaminated With 3,4-Benzfluoranthene Or 3,4-Benzfluoranthene and 1,2-Benzpyrene. 14135-D

Spectrophotofluorimetric Determination of Aldehydes With Dimedone and Other Reagents. 03255-D

Spectrophotofluorimetric Determination of 3-Carbon Fragments and Their Precursors With Anthrone. Application to Air Pollution. 01922-D

Spectrophotometric and Chromatographic Method of Monitoring Spacecraft Atmospheres. 03430-D

Spectrophotometric Determination of Aliphatic Aldehyde, 2,4-Dinitrophenylhydrazones With 3-Methyl-2-benzothiazolinone Hydrazone. 02084-D

Spectrophotometric Determination of Alkylating Agents With 4-Picoline and O-Dinitrobenzene. 00768-D

Spectrophotometric Determination of 4-Aminoazobenzenes, 4-Aminostilbenes, Schiff Bases, and Analogous Compounds With 3-Methyl-2-Benzothiazolone Hydrazone. 02805-D

Spectrophotometric Determination of Aromatic Polycyclic Hydrocarbons. Further Data on the Atmosphere of Rome. 00580-B

Spectrophotometric Determination of Azulene With Electrophilic Reagents. 02081-D

Spectrophotometric Determination of Benzene, Isopropylbenzene, and Alpha-methylstyrol in the Air. 04064-D

Spectrophotometric Determination of Benzo(a)pyrene in Airborne Particulates. 11093-D

Spectrophotometric Determination of Compounds Containing the p-Hydroxystyrene Group, 3-Methyl-2-Benzothiazolinone Hydrazone Procedure. 07801-H

Spectrophotometric Determination of the Concentration of Chlortetracycline in the Air. 02888-D

Spectrophotometric Determination of Dimethylphenylcarbinol and Dimethyl-Phenyl-p-Cresol in Air. 07578-D

Spectrophotometric Determination of Formaldehyde and Formaldehyde Releasing Compounds With Chromotropic Acid, 8-Amino-1-Naphthol-3-Sulfonic Acid (J Acid), and 6-Amino-1-Naphthol-3-Sulfonic Acid (Hemyl J Acid). 02586-D

Spectrophotometric Determination of Furfural in Air. 03038-D

Spectrophotometric Determination of Hydrogen Peroxide With 8-Quinolinol. 01615-D

Spectrophotometric Determination of Low Atmospheric Concentrations in the Presence of Other Products Liberated During the Manufacture of Synthetic Rubber. 07575-D

Spectrophotometric Determination of 1,4-Naphthoquinone and Its 2,3-Dichloro Derivative. 02087-D

Spectrophotometric Determination of Olefins. 01101-D

Spectrophotometric Determination of Olefins in Concentrated Sulfuric Acid. 03727-D

Spectrophotometric Determination of Primary Aromatic Amines With Thiothrithiazyl Chloride (Application to Determination of Toluene-2,4-Diisocyanate in Air). 06065-D

Spectrophotometric Determination of Thiophene in Air. 11498-D

Spectrophotometric Methods for Olefins (Colorimetric Determination of Conjugated Olefins). 03670-D

Spectroscopic Investigation of the Reaction Between Toluene and Cyclopropylamine. 01480-H

Spot Test Detection and Colorimetric Determination of Aliphatic Aldehydes With 3-Hydrazinobenzothiazole: Application to Air Pollution. 03088-D

Spot Test Detection and Colorimetric Determination of Aromatic Amines and Amino Heteroaromatic Compounds With 3-Methyl-2-Benzothiazolinone Hydrazone. 04867-D

Spot Test Detection and

Determination of Nitrites and Aromatic Nitrosamines With Benzaldehyde 2-Benzothiazolylhydrazone and p-Phenylazoaniline. 02094-D

Spray-Type Benzole Scrubber With Radially-Slotted Gas Distributors. 04581-E

Stainless Steel Anti-Smog Muffler--Cut Air Pollution. 07566-E

Standardization of Methods of Measurement of Air Quality in Member Countries. 05209-D

Statistical Survey of Data Relating to Hydrocarbons and Oxides of Nitrogen Relationships in Photochemical Smog. 03978-F

Statistics on Particulate Contaminants-San Diego County Air Pollution Control District (First Quarter 1966). 00184-A

Status of Engineering Knowledge for the Control of Air Pollution. 04599-E

Status Forecast for Air Pollution Control-1972. 08857-E

Status Report on Cost Factors in Exhaust Control. 01623-E

Status Report on Motor Vehicle Pollution in California. 07844-E

Status Report, (Solid Waste Disposal.) 08084-E

Status of Vehicle Emissions in Air Pollution. 02562-E

Colorimetric Determination of Aniline, Naphthylamine and Anthramine Derivatives With 4-Azobenzene-Diazonium Fluoborate. 02089-D

Spot Test Detection and Spectrophotometric Characterization and Determination of Carbazoles, Azo Dyes, Stilbenes, and Schiff Bases, Application of 3-Methyl-2-Benzothiazolinone Hydrazone, p-Nitrobenzenediazonium Fluoborate, and Fluorometric Methods to the Determination of Carbazole in Air. 02090-D

Spot Test Detection and Spectrophotometric Determination of Azulene Compounds With 2-Hydrazinobenzothiazole or 3-Methyl-2-Benzothiazolinone Hydrazone. 02091-D

Spot Test Detection and Spectrophotometric Determination of Azulene Derivatives With 4-Dimethylaminobenzaldehyde. 02092-D

Spot Test Detection and Spectrophotometric Determination of Compounds Containing the P-Hydroxystyryl Group; 3-Methyl-2-Benzothiazolinone Hydrazone Procedure. 02301-D

Spot Test Detection and Spectrophotometric Determination of Microgram Amounts of Aldehydes and Aldehyde-Yielding Compounds--a Review. 02304-M

Spot Test and Spectrophotometric Storage of Organochlorine Pesticides in the Body Fat of People in Western Australia. 10105-F

Storage of Vapors and Gases in Plastic Bags. 01083-H

Structural Effects in the Photochemical Processes of Ketones in Solution. 05100-H

Structural Effects on the

Role of Nitrogen Dioxide Formation in the Photo-oxidation of Organic Compound - Nitric Oxide Mixtures in Air. 01004-C

Structure and Reactivity in the Vapor-Phase Photolysis of Ketones. IV. Cyclopropyl and Olefinic Cyclic Ketones. 00877-H

Structure and Reactivity in the Vapor-Phase Photolysis of Ketones. V. Aliphatic Cyclopropyl and Olefinic Ketones. 07708-H

Studies on Air Pollutants. I. Analytical Methods. 11574-D

Studies on the Air Pollution Due to Automobile Exhaust Gases. 14467-D

Studies of Air Pollution Caused by Motor Vehicles. 14776-J

Studies of Air Pollution in the Department of the Seine in 1965. Part 3. Conditions at Orly Air Port. 00708-J

Studies of Air Pollution in the Department of the Seine in 1965. Part 4. Conditions in the Loop of the Seine. 00709-J

Studies on Air Pollution Owing to the Automobile Exhaust Gases. The Concentrations of C1-C6 Hydrocarbons in Some Inorganic Gases in the Exhaust Gases. 08403-D

Studies on the Analysis of Hydrocarbons From Incinerator Effluents With a Flame Ionization Detector. 05834-D

Studies of Analytical Methods for Lead-in-Air Determination and Use With An Improved Self-powered Portable Sampler. 06021-D

Studies on the Carcinogenicity of Gasoline Exhaust. 04539-F

Studies on the Chemical Estimation Method of Industrial Environment. II. Determination of Trichloroethylene, Chloroform and Benzyl-chloride by the Pyridine-Formalin Method. 08471-D

Studies of Combustion Processes Leading to Ignition of Some Oxygen Derivatives of Hydrocarbons. 03985-H

Studies to Determine the Mechanism of Production and Removal of Electrons in Flames. 05047-H

Studies of the Determination and Properties of Sulfur Dioxide in Air Contaminant. 16398-D

Studies on the Determination of Urinary Hippuric Acid in Toluene Poisoning. 03651-F

Studies on the Gas Chromatographic Determination of Mercaptans. 01280-D

Studies of the Gas Density Cell. 07450-D

Studies on Gasoline Engine Exhaust. 06108-D

Studies of Hydrocarbons in Mineral Oils; The Elution of 5:4 Benzene and Oils From Asbestos and Coal Dusts by Serum. 07783-F

Studies on the Incorporation of Acetate-1-^{14}C and Stearate-(1-^{14}C) into the Hydrocarbons of Chlorella pyrenoidosa. 10719-H

Studies on Pollution of Atmospheric Air With Maleic Anhydride. 02568-F

Studies of Pollution Levels in Relation to Air Movement in the Los Angeles Atmosphere. 05575-C

Studies of Radiationless Transitions in Benzene Using Nanosecond Laser Photolysis and Spectroscopy. 11188-H

Studies on the Removal and Catabolism of Cancerogenic Hydrocarbons in the Respiratory Tract of Golden Hamsters Exposed to Smoke. 14711-F

Studies on the Role of Sulfur Dioxide in Visibility Reduction. 05103-D

Studies of Size Distribution and Growth With Humidity of Natural Aerosol Particles. Part II. Investigation of the Composition of Atmospheric Aerosol Particles by Measurement of Particle Growth Due to Absorption of Water Vapor and Organic Vapors. 14811-H

Studies on Sulfur in Acetylene Gas Generated by Dry Type Generators and Method of Gas Purification 13497-D

Studies in the U.S.S.R. on the Distribution, Circulation and Fate of Carcinogenic Hydrocarbons in the Human Environment and the Role of Their Deposition in Tissues in Carcinogenesis: A Review. 07400-D

Study of Adsorption Beds of NH_3 and C_2H_2 on Wall and of C_2H_2 and C_2H_4 on Decomposed $NaHCO_3$. 13713-H

Study of Air Pollution With 3,4-Benzpyrene in the Vicinity of an Old Pitch-Coke Plant. 07300-B

Study of Air Pollution Carcinogenesis. 01813-F

Study of Air Pollution Carcinogenesis. II. The Isolation and Identification of Polynuclear Aromatic Hydrocarbons From Gasoline Engine Exhaust Condensate. 01803-B

Study of Air Pollution: Carcinogenic Activity of Gasoline Engine Exhaust Condensate. 04555-F

Study of Air Pollution Detection by Remote Sensors. 13057-D

Study of Air Pollution in the Interstate Region of Lewiston, Idaho, and Clarkston, Washington. 00054-B

Study of the Air Pollution in Iowa During 1966. 07405-J

Study of Air Pollution in Montana July 1961-July 1962. 02410-J

Study of Air Quality and Contaminant Analysis for Work Under Compressed Air. 13579-D

Study of Atomizer Aerosol Generators (Introduction-Section I.). 07371-H

Study of Automotive Exhaust Gases. 00674-B

Study of the Electromagnetic Properties of Some Fuels Derived From Atmospheric Dust and From Combustion Products of Different Fuel Types. 07201-F

Study of Catalyst Support

System for Pass-Abatement of Hydrocarbon Solvents. 00535-E

Study of the Chronic Effects of Insecticides in Man. 01080-P

Study of the Concentration of Polycyclic Aromatic Hydrocarbons in Gas Works Retort Houses. 01080-B

Study of the Continuous Determination of Organic Substances With Flame Ionization Detectors. 14722-D

Study of Crankcase Ventilation System Control Device Installations on the Los Angeles County Fleet. 00155-B

Study in the Development of Exhaust Emission Controls for Small Displacement Hands Engines. 14353-E

Study of the Effect of Molecular Oxygen on Atomic Oxygen-Hydrocarbon Reaction. 00130-C

Study of Effluents From Domestic Gas-Fired Incinerators. 14867-E

Study of the Eluting Power of Solvent Systems in Thin Layers of Florisil. 00385-F

Study of Methanol-Gasoline Blends as Automotive Fuel. 12161-E

Study of the Harmful Industrial Emissions in the Atmosphere in the Synthetic Rubber Plants in Yaroslavl and Yefremov. 00605-B

Study of the Hazards Presented by Soot and Air Dust With Particular Emphasis on Their Carcinogenic Action. Part 9-Separation of 3,4-Benzopyrene Following Soot Inhalation in the Lung of Live Rats. 11571-H

Study of the Hazards Presented by Soot and Air Dust With Particular Emphasis on Their Carcinogenic Action. Part 10-Dust Measurements by Means of the TM-T Apparatus at a Dust Section of Heidelberg. 11571-I

Study of the Influence of Fuel Atomization, Vaporization, and Mixing Processes on Pollutant Emissions From Motor-Vehicle Powerplants. 14850-E

Study of the Ignition Produced by the Catalytic Combustion of Hydrocarbons. 00080-D

Study of Irradiated Auto Exhaust. 01085-B

Study of Man During 56-Day Exposure to an Oxygen-Helium Atmosphere at 258 mm. Hg Total Pressure. II. Major and Minor Atmospheric Components. 04382-D

Study of the Minor Products of Coal Combustion. 05012-B

Study of the Physiological Effects of Carbon Black. (I. Ingestion). 04701-F

Study of the Physiological Effects of Carbon Black (II. Skin Contact). 04701-F

Study of the Physiological Effects of Carbon Black (III. Absorption and Elution Potentials; Subcutaneous injections). 04701-F

Study of Polycyclic Hydrocarbons and Iron Elements in Smoke in Merseyside

and Other Northern Localities. 05526-J

Study of the Possible Electromagnetic Properties of Some Substances Resulting From the Production of Synthetic Liquid Fuel. 07302-F

Study on the Relation Between Benzo(a)pyrene of the Suspended Matters and That of the Falling Matters in the Atmosphere. 14679-J

Study of the Retention and Subsequent Metabolism of Inhaled Methyl Iodide. 07026-F

Study of the Temperature Dependence of the Total Absorptance of CO Near 4.7 Microns and CO_2 Near 5.2 Microns. 02467-H

Study of Tobacco Smoking, Air Pollution, Residential and Occupational Histories and Mortality From Cancer of the Lung in Two Cities. 04051-F

Submarine Atmospheres and Air Pollution. 10159-E

Submarine Atmosphere Habitability Data Book. 00375-E

Submarine Atmosphere Studies Aboard USS Sculpin. 05057-J

Substantiation of the Maximum Permissible Concentration of Nitrobenzene in Atmospheric Air. 02586-F

Sulfonation and Sulfation. 14230-H

Sulfur Dioxide Role in Eye Irritation. 00084-F

Sulfur Recovery. 14505-E

Sulphonation of Organic Compounds. 10027-H

Sulphur Compounds in Urban Air. 00432-D

Sulphur Dioxide Recovery Method. 15830-E

Summary of 1961 Studies in the Field of Limits of Allowable Concentrations of Atmospheric Air Pollutants. 05053-D

Summary of 1964-1965 Air Quality Measurements. (90th Congress) 06707-J

Summary of Air Pollution Data for Los Angeles County. 03462-J

Summary of Data From the Continuous Air Monitoring Program. 03034-J

Summary Report of Vehicular Emissions and Their Control. 01848-E

Summary of the Use of Catalysts for Stationary Emission Source Control. 14326-E

Summer Ozone Concentrations in Southern Ontario in Relation to Photochemical Aspects and Vegetation Damage. 00606-D

Summer Travel Air Quality. 02250-J

Superdelocalizability Indices and the Pullman Theory of Chemical Carcinogenesis. 10520-H

Superior Thin-Layer Chromatographic Procedure for the Separation of Azo Arenes and Its Application to Air Pollution. 05519-D

Suppression of Carbon Formation in Partial-

Combustion Gasifiers. 01744-B

Surface Behavior of Individual Lipids Similar to Constituents of Pulmonary Surfactant. 07886-P

Surface-Coating Operations. 00518-B

Surveillance of Motor Vehicle Emissions in California. 00110-B

Survey of the Actual Conditions of Artificial Pearl Factories With Special Reference to the Work Using Tetrachloroethene. 03602-P

Survey of Air Pollution in Communities Around the John F. Kennedy International Airport. 01702-J

Survey of Hydrocarbon Ambient Air Concentration in Midland, Michigan. 00430-J

Surveying Air Quality at Dow Chemical Company. 00750-J

Surveys Performed in Belgium. Pollution by Effluents of Combustion in an Urban Zone With Heavy Population Density. 11577-J 11578-J

Symposium-Environmental Measurements-Valid Data and Logical Interpretation. 00951-B

Synergistic Effects in the Photooxidation of Mixed Hydrocarbons. 02382-C

Synergistic Properties of Aerosols. 00135-C

Synthesis and Cyclization of the Three Isomeric 2-Phenylphenyl Pyridyl Ketones. 01632-H

Synthesis of Defined Aerosol System. 01990-H

Synthesis of Naphtho(2,1-a)-perylene and Dibenzo(ae)-perylene. 01633-H

Synthesis of the Three Isomeric 7-Pyridylbenz(a)-anthracenes. 01634-H

Systems of Sulfur Dioxide and the Isomeric Xylenes. 16054-H

Tabulation of Gas Solubilities in Hydrocarbon and Other Non-Polymeric Solvents. 14867-H

Technical Analyses by Optical Methods (OT) Design of a Nondispersive Ultraviolet Gas Analyzer and Its Application to Quantitative Measurement of Traces of Toxic Gases and Vapors in Air. 00469-D

Technical Principle of Operation of Exhaust Gas Purifiers. 15343-E

Techniques Employed in the Analysis of Los Angeles Smog. 04073-D

Terpene Biosynthesis: Formation of Nerol, Geraniol, and Other Prenols in an Enzyme System From Pinus [illegible] Seedlings. [illegible]

Test Procedures for Evaluation of Industrial Fume Converters (Sampling and Analytical Techniques Reviewed for). 03666-D

Test for the Dusting Propensity of Toner Dye. 00275-D

Tests for Effect of Asbestos

on Benzo(a)pyrene Carcinogenesis in the Respiratory Tract. 01440-F

Tests to Establish Adequate Criteria for the Abatement of Atmospheric Pollutants and Suggestions for a Campaign to Combat Air Pollution. 04055-D

Tests of Various Particle Filters for Removal of Oil Mists and Hydrocarbon Vapors. 15526-H

Thanksgiving 1966 Air Pollution Episodes in the Eastern United States. 16018-C

Theoretical and Experimental Investigation of Chemical Kinetics during Rapid Expansions of CO_2 Temperature Gas Reaction Products. 07355-A

Theoretical and Practical Development of Flame Research. 14590-H

Thermal Degradation of Polymeric Materials. II. Toxicity Evaluations of Some Gases Evolving From Model 818 - LP 83 Composite Polymer. 04330-F

Thermochemistry of the Gas Phase Equilibrium II Plus C_2H_2 Equals C_4H_4 Plus III. 03078-H

Thermochemistry of the Gas Phase Equilibrium II Plus CH_4 (Reversible) CH_3 Plus III and the Heat of Formation of the Methyl Radical. 01582-H

Thermochemistry of the Gas Phase Equilibrium II Plus $C_6H_5CH_3=C_6H_5CH_2$ Plus III and the Heat of Formation of the Benzyl Radical. 00130-H

Thermochromic Detection of Polynuclear Compounds Containing the Fluorenic Methylene Group. 02095-D

Thermochromic Test for Polycyclic p-Quinones. 02096-D

Thermodynamic Efficiency of Gas Separation Plants. 15048-H

Thermodynamic Properties of Methane and Air, and Propane and Air for Engine Performance Calculations. 13544-H

Thermodynamic, Transport, and Flow Properties for the Products of Methane Burned in Oxygen-Enriched Air. 03446-H

9-Thienylanthracenes. 01639-F

7- and 12-Thienylbenz(a)-anthracenes. 01638-H

Thin-Layer Chromatographic Characterization Tests for Basic Polynuclear Compounds. 00767-D

Thin-Layer Chromatographic Separation and Analysis of Polynuclear Azo Heterocyclic Compounds. 00008-D

Thin-Layer Chromatographic Separation of Benzo(a)-pyrene and Benzo(b)Fluoranthene From Airborne Particulates. 01781-D

Thin-Layer Chromatographic Separation of Polynuclear Hydrocarbons on the Plate Composed of Two Adsorbent Layers. 05461-D

Thin-Layer Chromatographic Separation and Spectrophotofluorometric Identification and Estimation of Dibenz(a,e)-pyrene. 07743-D

Thin-Layer Chromatographic Separation and Spectrophotometric Determination of Benzo(a)pyrene in Organic Extracts of Air-Borne Particulates. 04329-D

Thin-Layer Chromatography Method for Estimation of Chloroplasmols. 05092-D

Thin-Layer Separation and Low-Temperature Luminescence Measurement of Mixtures of Carcinogens. 11567-D

Three Cases of Aplastic Anemia in Females Caused by Benzene and Toluene. 03000-F

Tissue Response to Intraperitoneal Asbestos With Preliminary Report of Acute Toxicity of Asbestos in Rats. 06710-F

Tobacco Smoke in an Enclosed Space. 06808-B

Tolerable Limits for Toxic Materials in Industry: Divergences and Points of Agreement at the International Level. 07351-F

Toward Cleaner Skies. 14002-B

Toxic Properties and Biotransformation of Monochlorides. 04104-F

Toxicity and Analysis of Air Pollutants. 13660-F

Toxicity of Aromatic Hydrocarbons in the Lung. 00803-F

Toxicity of Chronic Low Level Exposures to Toluene Diisocyanate in Animals. 07068-F

Toxicity of Ethylene Oxide in Low Concentrations. 12171-F

Toxicity Evaluation of Air Pollutants by Use of Luminescent Bacteria. 04635-D

Toxicity of Low Styrol Vapor Concentrations. 04084-F

Toxicological and Hygienic Studies on Dieldrin. 07552-F

Toxicology of Boron Hydrides--Studies of Alterations in Tissue Amines Toxic Decaborane-14 ($B_{10}H_{14}$) and Pentaborane-9 (B_5H_9) as Modified by Hydrazine and Propylamines. 09945-F

Toxicology of Quinoid Vapors and Resins. 02571-F

Trace Contaminant Analysis Test on Air Samples. 02460-D

Trace Contaminant Analysis Test on Air Samples-Phase II. 07887-D

Transfer and Conversion of Electronic Energy in Some "Model" Photochemical Systems. 00789-C

H_2-Transfer Reactions in the Gas-Phase Radiolysis of Hydrocarbons. 01855-N

Transformation of Gaseous Reactive Hydrocarbons into Aerocolloids by Ultraviolet Irradiation. 10041-N

Transport of Liquids in Structurally Modified Polyethylene. 15108-N

Trends in Air Conservation in the Graphic Arts Industry. 15408-B

Trends in Air Pollution

Damage. 01809-G

Trichlorethylene: A Review. 00820-F

Trichloromethanol in Trichloroethylene Poisoning. 00809-F

1,2,3,-Tris(2-Cyanoethoxy) Propane as a Stationary Phase in the Gas Chromatographic Analysis of Aromatic Hydrocarbons. 02160-H

Tritium in the Atmosphere. 07181-A

Two Sensitive Tests for Carcinogens in the Air. 00988-D

Ultrasonic Dissemination of Aerosols. 05085-H

Ultrastructural Alterations of Alveolar Tissue of Mice, I. (Due to Heavy Los Angeles Smog.) 04416-F

Ultrastructural Alterations of Alveolar Tissue of Mice, II. Synthetic Photochemical Smog. 06600-F

Ultraviolet, Visible, and Fluorescence Spectral Analysis of Polynuclear Hydrocarbons. 02805-D

Unimolecular Decomposition and Some Isotope Effects of Simple Alkenes and Alkyl Radicals. 05051-H

Unsensitized (Hg) Photolysis of But-1-ene at 1849 A. 00580-H

Uptake of Hydrocarbon Carcinogens by Lysosomes. 01081-F

Urinary Hippuric Acid Excretion as an Index of Toluene Exposure. 00702-D

Use of Chlorine Dioxide to Reduce Vapour Phase Gas in Town Gas. 03983-E

Use of the Chromatographic Equilibration Procedure for Air Pollution Studies. Determination of Minute Amounts of Benzene, Chlorobenzene, and Nitrobenzene in Air. 07452-D

Use of Coarse Porous Glass in Gas-Adsorption Chromatography for the Separation of Liquid Hydrocarbons. 04484-B

Use of the Correlation Spectrometer in the Study and Control of Air Pollution. 04880-D

Use of Gas-Liquid and Thin-Layer Chromatography in Characterizing Air Pollutants by Fluorometry. 00479-D

Use of Hydrocarbons Level Determinations in the Study of Air Pollution. 13788-J

Use of the Integrating Nephelometer to Measure Aerosol Formation From Hydrocarbons. 15308-C

Use of Low Temperature Van Der Waals Adsorption Isotherms in Determining the Surface Areas of Various Adsorbents. 13545-D

Use of Optical Pumping to Detect Free Radicals During a Gas-Phase Photolysis. 15045-H

Use of Silica Gel in Source Testing. 07706-D

Usefulness of the Method of Sine Wave Oscillating Pressure for Measuring Total Respiratory Flow Resistance in Human Subjects and Guinea Pigs. 08305-F

Usefulness of the Magnetometric Method for Benzene and Oil Determination in the Air. 00071-D

Utilization of Additives in Controlled Combustion Products. 08080-B

Utilization of Ammonia as An Alternate Fuel in Army Aircraft Engines. 03156-B

Utilization of Infrared Spectrophotometry in Environmental Studies of Closed Environments. 00781-B

Utilization of Petroleum and Petroleum Products. 08303-B

Utilization of Quantitative Fluorescence Spectra in Analysis of Polynuclear Aromatic Hydrocarbon. 10755-D

Vapor Phase Determination of Olefins by a Coulometric Method. 02162-D

Vapor-Phase Oxidation of Hydrocarbons, Part 2-Effect of Oxygen Concentration on Platinum-Catalyzed Combustion and Ionization. 15486-H

Variation in Piping Practices Which May Affect Emissions. 09655-B

Various Component Gases of Engine Generated Pollution Puse Differing Health Hazards. 05411-B

Vehicle Emissions and Effects. A Summary of the December 1961 Air Pollution Research Conferences. 00708-B

Vehicle Emissions vs. Fuel Composition. 14127-B

Vehicle Exhausts and Health. 00121-B

Vehicle Performance and Exhaust Emission, Carburetion Versus Timed Fuel Injection. 00936-B

Vehicle Pollution Problem. 04808-B

Vehicular Pollution Effects in Urban Development. 08300-J

Ventilation of Advance Headings. 03645-B

Ventilation for Engine Exhaust Gases. 01226-B

Ventilation and Methane Drainage in Longwall Mining. 01544-B

Ventilation Problems on Rapidly Advancing Faces, With Special Reference to This Seam. 01550-B

Verifying Adsorption Formulas by Means of Adsorption Measurements With Activated Charcoal. 14313-H

Visibility Reduction Due to Jet-Exhaust Carbon Particles. 00224-B

Volatile Organic Material of Plant Origin in the Atmosphere. 05750-D

Volatile Photodegradation Products of Organic Coatings. 05233-H

Volatility of Aerosols. 08157-H

Volatility of Polycyclic

Hydrocarbons. 00014-D

Volatization and Decomposition of Aromatic Polycyclic Hydrocarbons During the Usual Procedure for the Concentration of Extracts of Atmospheric Dust. 00206-D

Vapor Phase Photolysis of Benzene at 1849 A. 01035-H

Vapor Phase Reduction of Methyl Radicals With Crotonaldehyde. 00608-H

Vapor Pressure and Evaporation of Substances in Mobile Air. 05525-H

Vapor Tension and Vaporization of Substances in Moving Air. 00648-H

Variation in Ascorbic Acid Content in the Organism of Animals Chronically Exposed to Small Concentrations of Hydrocarbons. 05034-P

Variation With Polarizing Voltage of the Response to Methane, Carbon Dioxide and Nitrous Oxide of a Helium-Argon Ionization Detector for Gas Chromatography. 16277-D

Various Quenching Effects in Thin-Layer Chromatography Application to Air Pollution. 01054-H

Vital Staining of Tissue in Establishing Standards of Atmospheric Pollutants. 00607-P

Washington, D. C. Metropolitan Area Air Pollution Abatement Activity. 06290-J

Washout Coefficients for Selected Gases and Particulates. 00175-C

Waste-Gas Disposal System. 00655-B

Waste Incineration in Small Units. 00575-B

Water and Carbon Removal From Carbon Dioxide Reduction Systems. 04275-H

Water-Catalized Oxidation of Carbon Monoxide by Oxygen at High Temperature. 02286-H

Water as a Factor in Spreading Carcinogens in the Environment. 02506-P

Way to Determine Sulfur in Petroleum. 11171-B

Water and Disease. 00259-P

Web Printers and Air Pollution Control. 14757-B

What Value Front-End Volatility? 00421-B

What's in the Air. 07845-A

Where Does it All Go. 15713-C

White Paper About Public Relations 1968. 13566-K

Wire Reclamation. 00850-B

Zenith Duplex Induction System. 08051-B

Zonal Study of Atmospheric Air Pollution in Areas Surrounding a Roofing Tar Paper Plant. 08163-J

SUBJECT INDEX

Abatement 13551-B

Abscission 11100-G

Absorbers 02474-B

Absorption 00370-B 01205-D
01410-D 05800-F
06033-B 08162-B
09795-B 15278-B
13836-B 15661-B
15892-B 15999-B
15873-B

Acetic Acids 03085-B

Acetone 07573-F

Acetophenone 04070-F
07575-F

Acetyl Peroxide Ethanol
13505-B

Acetylcholinesterase
02348-D
See also: Enzymes

Acetylene-Oxygen Flames
05345-B

Acetylenes 04102-B
13807-B 00161-B
03062-B 05425-B
07458-B 15136-B
15070-B 16439-B

Acridines 00203-D 00328-D
06200-D 00624-D
00098-D

Activometers 01110-B

Activated Charcoal
02764-B 05209-B
05899-B 06056-B
See also: Charcoal

Activation Analysis
06016-D 02305-D

Activation Energy
01677-B 05063-B

Active Nitrogen
05126-B

Addition Reactions
03062-B

Adrenal Glands 13960-F

Adsorbents 05145-B

Adsorption 01025-D
01410-D 03185-D
03425-D 04047-D
04648-D 13620-D
14425-D 16480-D
03762-B 03783-B
04871-B 04874-D
05537-B 05800-D
06164-B 06353-B
06703-B 13817-B
13785-B 16020-D
16435-B 16417-B
01801-D 02374-B
05056-B 13415-B
13490-B 15535-B
13666-B 15686-B
15713-B 13766-B
13676-B 14258-B
14313-B 14301-B
15018-B 15167-B
15187-B 16548-B

Aerodynamics 04581-B

Aerosol Propellant
05337-B

Aerosol Spectrometers
06231-D

Aerosols 06722-A 05470-B
06238-G 15818-G
00484-D 01592-D
02205-D 02323-D
02433-D 02657-D
04040-D 06021-D
06231-D 06445-D
06504-D 15808-D
01722-F 01805-F
07027-F 00060-B
01518-B 01860-B
02412-B 02035-B
05840-B 06103-B
07108-B 07172-B
07272-B 07273-B
08387-B 08061-B
14811-B 15716-B

Afterburners 00468-D
00087-B 01023-D
03658-B 04066-B
14484-B 14767-B

Aging 12175-F

Aircraft 06471-D
See also: Airplanes

Aircraft Engine Exhaust Emissions 15309-B

Air-Fuel Ratio 00092-B
01132-B 01388-B
02066-B 06153-B
06411-B 12067-B
01451-D 01860-B
03456-B 06822-B
07846-B 01446-B
15287-B

Air-Fuel Ratio Regulator
10026-B

Air Guard System
02405-B

Air Injection Reactor
04276-B

Airplanes 03158-B
06031-B 14602-B
See also: Aircraft

Air Pollution Control
00350-B

Air Pollution Forecasts
00783-G

Airports 00482-G 01302-J

Air Quality 12177-A
15715-L

Air Quality Criteria
11237-A 04066-F
07601-L 07604-L
07605-L

Air Quality Criteria in Meat & Meat Range 07604-L

Air Quality Data - 1966 05136-J

Air Quality Measurement Programs 00051-D 04858-D 01871-D 03773-D 05322-D 00234-D 00370-J

Air Quality Measurements 14479-A 00051-D 00068-D 00114-D 00141-D 00188-D 00224-D 00293-D 00440-D 00728-D 01356-D 01400-D 01670-D 02538-D 02685-D 02706-D 01707-D 02886-D 03080-D 03440-D 03520-D 03775-D 04596-D 05042-D 05501-D 05052-D 06614-D 07504-D 07870-D 00432-D 10668-D 14500-F

Air Quality Standards 01770-J 03862-J 01055-L 03007-L 03582-L 12020-L

Air Resource Management Program 01211-A 01890-D 00847-J 06188-L

Airsheds 12177-A 00526-J

Alcohols 02548-D 02544-D 03084-D 04254-D 06005-D 07578-D 01722-F 01835-F 36105-F 12172-F 14220-F

Aldehydes 00464-D 01058-A 00341-B 00106-D 00845-D 00027-D 01798-D 01602-D 01022-D 01094-D 03077-D 02079-D 03084-D 02086-D 02088-D 02097-D 02098-D 03253-D 03525-D 03542-D 03638-D 03658-D 04635-D 06195-D 06693-D 07878-D 00021-F 01403-F 01463-F 00091-G 00606-H 02555-H 03026-H 04288-H 04788-H 05611-H 08105-H 08627-H 10519-H 12160-H

Aliphatic Nitrogen Compounds 04575-F See also: Organic Nitrogen Compounds

Alkanes 04484-D 00180-H 01835-H 07528-H 04456-H 05051-H 07708-H 09267-H 10028-H 11230-H 11248-H 15238-H

Alkyl Radicals 02078-D 03091-D 03066-H 03067-H 03078-H 05051-H See also: Aluminum Alkyls

Alkylation 00708-D

Allergies 01794-F

Altitude 01837-B

Aluminum 01687-B

Aluminum Alkyls 12150-B See also: Alkyl Radicals

Aluminum Oxide Packed Glass Capillary Columns, 12663-D

Aluminum Plants 03940-D 06244-F

Alveolar Tissues 04416-F 06600-F

Amines 00867-D 00026-D 02078-D 02070-D 02080-D 02843-D 03360-D 05037-D 04086-D 04255-D 05370-D 06065-D 15708-D 01692-F 02810-J 02480-M

Amino Acids 02843-D 04029-D

P-Aminopropiophenone 04027-F

1-Aminopyrene 01075-D

Ammonia 10044-B

Ammonia Sulfate 03055-B

Analytical Methods 03205-A 03674-A 01534-B 01805-B 02806-B 07214-B 11562-B 00465-C 00056-D 00092-D 00108-D 00122-D 00328-D 00765-D 00845-D 00867-D 00868-D 00869-D 00928-D 01208-D 01395-D 01451-D 01461-D 01499-D 01500-D 01502-D 01505-D 03081-D 02138-D 02246-D 02415-D 02460-D 02538-D 02803-D 02805-D 03010-D 03096-D 03103-D 03267-D 03363-D 03560-D 03629-D 03829-D 03906-D 04262-D 04541-D 04631-D 04830-D 05209-D 05501-D 05502-D 07403-D 07427-D 07432-D 07564-D 07577-D 07706-D 07887-D 07906-D 08070-D 08226-D 08294-D 08644-D 08762-D 08880-D 00333-D 00543-D 00560-D 10480-D 10900-D 11061-D 11068-D 11165-D 11270-D 11554-D 11558-D 11560-D 11567-D 11574-D 13154-D 13543-D 13900-D 15171-D 15355-D 15763-D 16308-D

Analytical Methods (contd.)
03013-P 13000-P
00608-M 00770-H
00000-M 01006-H
07305-H 10046-H
15204-H 15911-H

Anemia 05720-P

Anesthetics 10252-P

Animal Experiments
00148-P 00484-D
01601-D 01806-P
03870-P 05021-P
08017-P 20040-P
20511-D 11550-P
15886-P 51571-H
See also: Experimental Animals

Animals 00318-P
04580-P 00737-G
03116-G

Anthracenes 01305-D
03234-D 06200-D
08521-D 08043-D
08644-D 11554-D
11567-D 00111-J
04038-J 00015-H
01030-H 01034-H
01035-H 02405-H
00200-H

Antimony 01022-D

Area Surveys 03488-A
02052-G 09054-D
00220-H 00237-H
05118-D 05575-G
03820-M 03778-D
03002-P 00591-J
00780-J 00803-J
01040-J 02455-J
03303-J 03604-J
03400-J 03410-J
03420-J 03455-J
03441-J 03451-J
03454-J 03458-J
03504-J 03503-J
03506-J 04770-J
04033-J 04034-J
04004-J 05900-J
05575-J 05518-J
05652-J 06300-J
06585-J 06146-J
06066-J 06077-J
07400-J 08315-J
00117-J 00200-J

Aromatic Amines 03288-P
See also: Amines

Aromatic Fractions
03276-P 05850-J

Artificial Pearl Factories
07002-P

Asbestos 71440-P
06710-P 07705-P
08511-P 10230-P
10241-P 01467-H

Asphalt 00021-D
03276-P 08015-P

Asphalt Air Blowing
00021-D

Asphalt Hot Road Mix
00021-D

Asphalt Saturated Felt Roofing, 03252-D

Aspirators 13018-D

Atmospheric Interaction
10256-J

Atmospheric Phenomena
00034-C 05606-C

Atmospheric Temperature
07306-P

Atmospheric Ultraviolet Radiation, 01027-C

Atomic Oxygen 00130-C
03004-C

Atomization 00057-D
14850-D

Atomizers 01990-H
07371-H 07372-H
07375-H 00001-H

Auto Exhaust Analyzer 12018-D

Auto Exhaust Air Pollution 01642-P

Autocatalysis 03002-H
01000-H

Automatic Measurement Methods 01002-D
01003-D 07005-D
15171-D

Automobiles 01404-D
01015-D

Automotive Emission & Controls 00057-D
03171-D 00310-D
00004-D 00160-D
01000-D 01003-D
01000-D 01004-D
03111-D 03206-D
04000-D 04313-D
00011-D 04701-D
07215-D 07017-D
07530-D 00111-D
00421-D 10115-D
00102-D 00155-D
00000-D 03040-D
07007-D 13000-D
00036-D 01411-D
01075-D 03142-D
04574-D
04771-D 04009-D
00300-D 00537-J
01000-D 00115-D
04000-D 04134-D
07474-D 07500-D
07000-D 07503-D
00005-D 00004-D
00017-D 11200-D
13013-D 15104-D
14036-D 14097-D
14005-D 14713-D
15305-D 16152-D
10000-D 00157-D
00000-D 03054-D
03014-D 03044-D
07015-D 10205-D
14475-D 14335-H

Automotive Emission Tests, 14007-D

Automotive Exhausts
00010-J 00324-J
01192-J 01193-J
01228-F 01375-J
01381-J 01382-J
01385-J 01386-J
01415-J 01675-J
01815-J 01857-J
01858-J 01864-J
01886-J 01892-J
01894-J 01903-J
04000-J 04018-J
04460-J 04630-J
04693-J 04694-J
05007-J 05100-J
05115-J 05291-J
05411-J 05880-J
06350-J 07015-J
07626-J 07630-J
07655-J 08165-J
08653-J 09341-J
09355-J 09380-J
09405-J 10662-J
10734-J 11254-J
11862-J 13562-J
00036-J 00068-J
00108-J 00122-J
00142-J 00146-J
00155-J 00277-J
00460-J 00584-J
00620-J 00772-J
00808-J 00911-J
01225-J 01260-J
01495-J 01560-J
01720-J 01831-J
01926-J 02130-J
02358-J 02378-J
02785-J 02846-J
03113-J 03207-J
03977-J 04318-J

04760-J 04839-J
04857-J 04860-J
05135-J 05203-J
05339-J 05536-J
05685-J 06052-J
06435-J 06609-J
07104-J 07400-J
07627-J 07628-J
07807-J 08270-J
08681-J 09342-J
09388-J 09574-J
10243-J 11237-J
11554-J 12515-J
13763-J 15004-J
15009-J 16152-J
03206-J 10530-J
00105-F 00475-F
00870-F 01603-F
01047-F 01946-F
02332-F 03070-F
03214-F 03270-F
03685-F 03823-F
04253-F 04505-F
06000-F 07015-F
07844-F 07951-F
08881-F 11652-F
03506-G 00115-G
00058-H 03611-H
05840-H 06006-H
10120-H 15011-H

Autoxidation 03104-J

Autoxidized Cascade Cycle 15134-H

Azines 01501-J 03020-J

1,1' Azoisobutane 07812-H 11348-H 11230-H

Azulenes 02085-J 02091-J 02092-J 07878-J

Background Statistics 11004-G

Bacteria 04635-J 07400-J 00003-F 04551-F 04650-F 05204-F 00251-H 07188-H 07465-H
See also: Microorganisms

Bacteriophage 07785-F

Barley Seedlings 00001-G

Battery Post Cells 01807-J 04215-J 04310-J 02442-J 04271-J
See also: Post Cells

Beaver Report (England) 00752-J

Beckman Fission Reactions 07838-J

Behavior 07306-F

Bentonite 15066-H

Benzamides 02210-J

Benzanthracenes 02607-H 11210-J 15337-J 01028-H
See also: Anthracenes

9H-Benz(de)anthracen-7-one, 11210-J 15337-J
See also: Benzanthracenes

Benzene Hexachloride (BHC), Gamma 16526-J
See also: Benzene Compounds

Benzene Compounds 16526-J 00177-G 01025-G 01084-G 00203-J 00205-J 00766-J 00911-J 01007-J 02805-J 03081-J 03820-H 04060-J 04143-J 04208-J 04210-J 04742-J 05092-J 05376-J 05052-J 05050-J 06021-J 06661-J 06702-J 07061-J 07155-J 07452-J 07578-J 10772-J 11558-J 11650-J 15749-J 04471-H 04874-H 02366-F 03021-F 03000-F 03035-F 04142-F 04146-F 04701-F 04703-F

Benzene Compounds (contd.)
00651-P 00681-P
00693-P 00706-P
00708-P 00740-P
00745-P 00811-P
00836-P 10179-P
00708-J 00834-H
00838-H 01006-H
01078-H 01403-H
00817-H 00700-H
14383-H 10401-H
10000-H 10017-H
10388-H

Benzene Soluble Compounds
11260-P
See also: Benzene Compounds

Benzene-Soluble Organic Matter 00720-D
00303-D 00720-D
00838-P 00383-P
03160-J 03426-J

Benzhydrole 01210-H

Benzo(a)pyrene 00631-A
00838-A 03835-A
04008-A 04108-A
05003-A 10734-A
10004-D 11001-D
11003-D 00818-P
00063-P 00864-P
00750-P 00754-P
00842-P 00870-P
01015-P 01020-P
01440-P 01600-P
04177-P 04551-P
04705-P 04709-P
04713-P 04712-P
04714-P 05200-P
05372-P 07201-P
07301-P 07340-P
07705-P 08210-P
08338-P 08500-P
08660-P 09753-P
11299-P 10000-J
03061-J 03225-J
03585-J 04038-J
06700-J 08485-J
11015-J 11570-J
15240-J
See also: Benz(a)pyrene
3,4-Benzpyrene
Benzopyrene Pyrenes: Carcinogens

Benzoles 04581-H

Benzophenone 07207-D
11210-D 12010-H
01210-H 01300-H
10030-H 11210-H
See Ketones

Benzotrichloride 04154-P

Benz(a)pyrene 03606-P
04710-P 04711-P
04660-P 08,70-P
03015-J 04001-J
See also: Benzo(a)pyrene
3,4-Benzpyrene Benzopyrenes
Pyrenes: Carcinogens

Benzpyrenes 15668-A
00113-D 0x411-D
01356-D 01365-D
01710-D 01720-D
01731-D 01781-D
01000-D 02040-D
02010-D 02183-D
02130-D 02581-D
02780-D 02707-D
03003-D 03342-D
03040-D 04008-D
01240-D 04320-D
05605-D 06200-D
06,50-D 06634-D
06662-D 07208-D
07400-D 07745-D
08043-D 08044-D
14125-D 14008-D
15763-D 03670-P
08008-P 14411-P
14670-J 02203-H
02403-H 02853-H
07108-H 07403-H
11571-H

3,4 Benzpyrene 07299-A
07300-A 07570-A
08200-A 01500-P
02680-P 03082-P
04702-P 06208-P
07302-P 07785-P
09055-P 14711-P
16210-P 16542-P
03025-J 06700-J
06788-J 07293-J
07300-J 11014-J
16536-J
See also: Benzopyrenes Benz(a)pyrene
Benzo(a)pyrene
Pyrenes: Carcinogens

Benzyl Chloride 15749-D

Benzoyl 01483-A
00720-D 00868-D
01302-D 01015-P
04551-P 03169-J

Biological Indicators 00720-D
00868-D 03836-D

Biological Tissues 01030-P

Bioluminescence 04035-D

Biomedical Techniques & Measurement 01460-P

Biosphere 14019-C

Biosynthesis 10116-C

Birds 00266-P
04709-P 04711-P
04713-P

Blast Furnaces 14389-H

Blood Cells 07308-P
08520-P

Blood Chemistry 01483-P
03806-P 03836-P
04151-P 04148-P
04725-P

Blood Coagulation System 08520-P

Blowby 03364-D 03561-D
04003-D 05506-D
01580-D

Blowby Emissions 02376-D

Body Fluids 03561-D

Bosch Reduction Reactor 04275-H

Boronia alarensis 00150-C

Breathing 02147-B
01325-B 11545-H

Bronchoconstriction
Acetylcholine 00067-B
00120-B 00205-B
12001-B
See also: Cholinergic

Bronchitis Cancer
00205-J

Bronchitis 00068-F
00113-F

Butadiene 01281-J
01283-H 01301-H
12042-H 12043-H
See also: Olefins

Butanes 00130-D
01317-D 01318-D
02017-D 02417-D
02418-H 02419-H
See also: Aliphatic Hydrocarbons

Butenes 01814-D
04435-D 04701-D
07100-H 07179-H
07403-H 09070-H
09080-H 10024-H
See also: Olefins

Butyl Halides 03613-H

By-Product Recovery
00100-B 00170-B
00302-B 14001-B
16005-L 04008-H
11574-H

Caffeine 00491-D

Calcium Compounds
13178-H

Calibration Methods
01313-D 01314-D
00083-D 00307-D
00080-D 10000-D
15009-D 11543-H

California State Department of Public Health
16118-L

Camera 01710-D
01746-D 01747-D
01748-D 01749-D
01750-D 01751-D
01752-D 01753-D
01754-D 01755-D
07100-D 08251-D

Carburetor 00130-D
00317-D 00318-H

Carbohydrates 07870-D
See also: Sugars

Carbon Black 01500-H
10000-H 10010-D
10700-D 10702-D
10703-D 10704-D
10711-D

Carbon Dioxide 00141-D
00277-D 00360-D
01001-D 01100-D
07011-D 08210-D
08100-H 08173-H
08180-H 08181-H
10700-H 10824-H

Carbon Dioxide Acceptor Process 10524-H

Carbon Monoxide 04030-B
00141-D 00277-D
00469-D 02150-D
03005-D 07150-D
07504-D 07617-D
08030-D 08488-D
08721-D 07500-J
02253-H 02286-H
02467-H 02474-H
03186-H 04055-H
08877-H 10292-H
14150-H

Carbon Tetra Chloride
03820-F 03871-F
08026-F 08028-F
08205-F 11530-F

Carbonyl Compounds
01640-C

Carbonyl Oxide 00365-H

Carboxylic 00404-B
00145-D 00934-D
01501-D 01720-D
01978-D 01984-D
04070-D 04074-H
07010-H

Carburetion 02130-D
01001-B 01075-B
00337-H 10307-H

Carburetor Evaporation Losses 07030-B

Carcinogens 00021-B
00031-B 01009-B
01361-B 01404-B
01405-B 01700-B
01903-B 02023-B
01500-B 04025-B
01545-B 04055-B
04000-B 04100-B
05001-B 05100-B
06100-B 06800-B
07000-B 07070-B
08200-B 08405-B
10031-B 10741-B
11000-B 14124-B
14010-B 14024-B
30120-B 00114-D
00451-D 00470-D
00024-D 00720-D
00031-D 00800-D
03150-D 01714-D
01720-D 01735-D
01781-D 01900-D
02040-D 02220-D
02735-D 02736-D
02501-D 02705-D
02805-D 03600-D
03542-D 03940-D
04014-D 04065-D
04210-D 04320-D
05004-D 05502-D
05005-D 06150-D
06200-D 06500-D
06030-D 06062-D
07000-D 07400-D
07745-D 08090-D
08321-D 08500-D
08643-D 08644-D
10767-D 10946-D
10964-D 11001-D
11003-D 11554-D
11567-D 14650-D
15700-D 15765-D
15977-D 02600-E
01861-E 06674-E
10637-E 00195-F
00518-F 00630-F
00661-F 00664-F
00750-F 00842-F

Carcinogens (contd.)

Carcinoma 11275-P

Carrier Gases 01771-M

Cascade Samples 02323-D

Catalysis 13033-E
13054-M 00097-E

Catalysts 04172-B
Catalytic Activity
Catalytic Afterburners
Catalytic Combustion
Catalytic Converters
Catalytic Muffler
Catalytic Oxidation
Cattle 05421-G
Cell Growth 05254-P
Cell Metabolism
Cells 01063-P 00384-J
Centrifuge, Evaporative
Cerosin Aerosols
07156-D
Charcoal 01301-D
Charcoal Grilling
Chassis Dynamometer
03547-A
Chemical Analytical
Methods

Chemical Bonds 01601-F

Chemical Composition
01307-B 01375-B
01629-B 01824-B
01967-B 01974-B
02040-B 02060-B
02438-B 02611-B
03179-B 03611-B
04010-F 04017-F
13606-J 13708-J
14745-J 14875-J
15048-N 15101-N
15415-N 15800-N

Chemical Compounds
10218-C 00068-D
01410-D 01972-F
02341-N 03035-N
09764-N

Chemical Industry
03129-B

Chemical Plants
11014-J

Chemical Processes
01134-B 01236-B
14767-B 15367-B
01430-D 01500-D
14438-D 00107-N
11010-N 13014-N
00085-F 01017-F
04156-G 13415-N
15048-N 15090-N

Chemical Reactions
00727-A 00302-C
04088-C 09004-C
01085-D 00607-D
07884-D 14764-N
00608-N 04188-N
04180-N 07408-N
07500-N 11050-N
11805-N 16082-N
16439-N 16589-N
16828-N

Chemical Synthesis
01635-N

Chemiluminescence
00426-D 03188-D
11097-N

Children 04037-F
06869-F 10867-F
11274-F

Chloride Accumulation
00119-N

Chlorine 16001-N

Chlorine Dioxide Treatment
03005-D

Chlorophenols
01097-D

P-Chlorophenyl Isocyanate
04188-F

Chloroplasts
07425-G

Chloroprene 02121-D
11275-F 02502-J

Chlortetracycline
01559-D

Chromatograph Back Flush Use
05057-J

Chromatography 00060-D
00100-D 00141-D
00230-D 00304-D
00460-D 01000-D
01705-D 01780-D
07113-D 07878-D
11068-D 14381-N

Chromatography, Column
00142-D 00614-D
00926-D 00954-D
01970-D 02247-D
03581-D 04430-D
06380-D 07435-D
11574-D 13668-D
14662-D 01812-N
06980-N 07306-N

Chromatography, Gas
01152-B 01166-B
04731-B 05337-B
07214-B 10404-B
00955-C 01701-C
00030-D 00670-D
00947-D 00610-D
00776-D 00011-D
00942-D 01270-D
01280-D 01310-D
01302-D 01430-D
01503-D 01764-D
01920-D 01979-D
02120-D 02160-D
02300-D 02672-D
03111-D 03430-D
03754-D 03767-D
03901-D 04143-D
04108-D 04384-D
04408-D 04827-D
04885-D 05016-D
05135-D 05203-D
05304-D 05670-D
01840-D 06301-D
06001-D 06311-D
06510-D 06699-D
07001-D 07140-D
07356-D 07433-D
07618-D 07749-D
07850-D 07887-D
08105-D 08356-D
08367-D 08610-D
08940-D 09102-D
09215-D 09588-D
09574-D 10230-D
10040-D 11104-D
11154-D 11510-D
11550-D 13001-D
13063-D 13648-D
13770-D 13874-D
14450-D 14630-D
15370-D 15541-D
15807-D 15904-D
16010-D 01082-J
01160-N 01204-N
01812-N 07301-N
08118-N 13062-N
14580-N 14648-N

Chromatography, Paper
00440-D 00760-D
00868-D 00911-D
01720-D 01991-D
06905-D 11056-D
11485-D 02310-J
02495-N

Chromatography, Thin-Layer 00611-D
00114-D 00300-D
00470-D 00624-D
00766-D 00767-D
00860-D 00918-D
00920-D 00931-D
00934-D 00988-D
01430-D 01581-D
01736-D 01781-D
01785-D 01826-D
02705-D 04328-D
04320-D 05002-D

Chromatography, Thin-Layer (contd.) 00461-D 00955-D
07745-D 08509-D
09213-D 09307-D
10707-D 11068-D
11001-D 11093-D
11218-D 11574-D
14662-D 15337-D
00860-M 01034-M

Chromotropic Acid
03680-D

Cigarette Smoke
03630-F

Ciliary Activity
02248-D

Citrus Crops 03611-G

Clean Rooms 04139-E

Cleaner Air Package, 00154-B

Cleavage 01618-M

Closed Ecological Systems 10025-B

Coal 01482-B 05067-B
10429-B 01305-D
07783-F 10292-M
13836-M

Coal Briquets 02600-E

Coal Characteristics
13494-A 00630-E
13706-M 13882-M
15481-M

Coal Preparation Processes 10047-E
10030-M

Coal Tar Dye Plant, 01038-B

Coal Tar Pitch
02573-B 00011-D
00230-D 02226-D
03725-E 11577-J

Coarse Porous Glass Column 04494-D

Cocarcinogenicity
01471-J

Cochineal (Xanthium pennsylvanicum Wallr.) 07187-G

Coffee 03554-D

Coke 15014-M

Coke Ovens 16125-B

Colloids 10041-M

Colorimetric Analysis
04245-C 00845-D
00867-D 01802-D
01873-D 01895-D
01897-D 01898-D
01899-D 02077-D
02079-D 02083-D
02084-D 02085-D
02086-D 02087-D
02088-D 02089-D
02090-D 02091-D
02092-D 02094-D
02095-D 02096-D
02097-D 02121-D
02135-D 02161-D
02544-D 02595-D
02785-D 02798-D
02801-D 02803-D
02803-D 02854-D
03096-D 03523-D
03537-D 03670-D
03680-D 03684-D
03920-D 03937-D
04029-D 04086-D
04090-D 04210-D
04214-D 04255-D
04440-D 04742-D
04825-D 05210-D
06112-D 06661-D
06876-D 06876-D
06895-D 08171-D
10089-D 15750-D

Combined Effect 11479-C

Combustible Organic Waste Gases 10211-D

Combustion Chambers Deposits 04460-B
14033-B

Combustion Ignition 04926-M

Combustion Inhibition 11210-M

Combustion, Oscillatory 03588-M
See also: Perturbations

Combustion Products
00780-A 00827-B
01744-B 01788-B
02001-B 02335-B
04895-B 05011-B
05012-B 07451-B
10475-B 10741-B
00275-D 01280-D
01748-D 05005-D
06328-D 04279-E
08080-E 08470-E
05440-M 09171-M
15481-M

Combustion Stability 03588-M

Combustion Temperatures 05043-M

Commercial Firms 01075-A 02234-B

Compact Cars 04028-B

Computer Programs 11225-C 00277-D
16023-M

Concentrations
01671-B 01958-B
02610-B 03255-B
07635-B 03059-D
03360-D 03520-D
04040-D 07830-D
01980-J 05110-J

Condensation 08161-E
07495-M

Condensation Nuclei Counters 08731-D
11540-D

Coniferous Forests 04230-G

Conservation of Clean Air and Water - Western Europe, (EUROAIR) 14708-B

Construction Materials 08033-B 11480-D

Contact Processing
15873-M

Continuous Air Monitoring Program (CAMP)
06773-A 06929-C
06941-J 01912-J
03024-J 06701-J
06707-J 11267-J
See also: Continuous Monitoring

Continuous Measurements
01828-C

Continuous Monitoring
00051-D 00141-D
00645-D 00977-D
01871-D 02354-D
03520-D 03560-D
05585-D 05837-D
06025-D 06455-D
06471-D 07564-D
07885-D 08257-D
08502-D 09234-D
13050-D 14722-D
15171-D 15200-D
15484-D 15909-D
15294-M
See also: Continuous Air Monitoring

Contractility 16252-F

Control Agencies, Federal
14728-E

Control Agencies, Netherlands 14916-J

Control Equipment
09780-A 09787-B
00257-B 02411-B
02541-B 03662-B
03702-B 08837-B
09793-B 09795-B
12058-B

Control Methods
00570-B 01744-B
15383-B 00060-D
00460-D 03185-D
03866-D 04648-D
07400-D 13301-M
13553-M 13666-M
14336-M 14388-M
15167-M 15524-M

Control Programs
01165-B 04509-B
09752-B 09759-B
04962-D 05320-E
05895-J 08408-E
08899-E 00157-L

Controlled Atmospheres
08025-B 08851-B
00142-D 02336-D
03185-D 03450-D
03829-D 04262-D
05042-D 10672-D
04279-E 06292-E
06512-E 03820-F
03821-F 08026-F
08028-F 11539-F
05666-G

Cooling 15778-E

Combustion 08359-B
10475-B 11263-B
00060-D 02233-D
07692-D 08136-D
02973-E 05209-E
15657-M 01241-M
02253-M 03107-M
03985-M 04550-M
04653-M 05047-M
05525-M 05645-M
09046-M 11210-M
12058-M 13560-M
14379-M 14385-M
14388-M 14399-M
14622-M 15486-M

Combustion Gases 00030-B
05640-B 11231-B
02158-D 04667-D
11554-D 13028-D
14430-D 15277-D
14004-E 15657-M
02485-M 02734-M
03446-M 04550-M
05643-M 06625-M
12949-M 14450-M

Copper Oxide 05147-B

Core Ovens 09803-B

Corrosion 11188-M
15491-M

Correlation Techniques
01729-D 10348-D

Corrosion 02380-M

Costs 00566-B 04509-B
08394-B 08594-B
09758-B 11265-B
01623-E 06144-E
08365-E 13551-E
12045-G 07696-I
11204-I 16174-I
16417-I 03462-J
15078-M

Cotton 06548-G

Coulometry 02162-D
12002-D
See also: Bromocoulometric Analytical Method

Coulter Counters
08083-D

Coumalin Dimerization
03809-M

Countercurrent Contacting Device 02374-M

Crankcase Emissions
01894-B 03580-B
05155-E

Critical Orifices
08078-M

Crude Oil
04109-F 04110-F

Crude Oil Tars
04108-B

Cryogenics 00070-D
15085-M

Crystal Structure
15405-M

Cumene Hydroperoxide
01595-D

Cupric Oxide-Alumina
01497-E

Cyclic Olefines
16626-M

Cyclization 01628-M
01630-M 01632-M

Cyclohexadiene 05425-M
07457-M

1,1-Cyclohexanediene
03253-D

Cyclohexanol 01605-F

Cyclopentadienes
01801-D

Cyclopenta(c,d)pyrene
14301-D
See also: Pyrenes

Cyclopropane 16352-F

Cyclopropylamine
02489-M
See also: Amines

Cylinders 07705-M

Cytology 03678-F

Data Analysis 00910-F
00521-J 02351-J

Data Handling System
00725-A 00337-B
00277-D 05339-D

(2,4-D) 2,4-Dichlorophenoxy Acetic Acid
07008-M

(DDT) 2,2 bis
(p-chlorophenyl)-1,1,1-trichloroethane
01616-B 16326-B
04107-F 07956-F
08329-F

Decay Rates 06504-D

Decomposition 00426-D
15467-B 01677-M
03009-M 04486-M
05051-M 06097-M
07988-M 08105-M
09745-M

Degassing 04179-B
13881-M

Dehydrogenation 01655-M

Density 01358-M

Deposition 16125-B

07017-F 08483-F
03785-G 07705-M

Design Criteria
03501-A 00592-B
02001-B 16074-B
00623-D 03425-D
07838-D 08356-D
16179-D 06292-F
08565-B 09529-B
13018-B 14341-B
13504-M 16485-M

Design Engineering
01715-B

Desorption
07706-D 15541-D
00383-B

Desulfurization of
Fuels 13779-D
06479-B 15527-B
00353-M

Detection Thresholds
14470-D

N, N-Dialkylanilines
02078-D
See also: Organic
Nitrogen Compounds

1,2,5,6-Dibenzanthracene
01607-D
See also: Anthracenes

Dibenzopyrenes 01631-M
See also: Pyrenes

Dichloroethane
14775-D 08151-F
See also: Halogenated
hydrocarbons

Dieldrin 1,2,3,4,10, 10-hexachloro-6,7, epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5,8-dimethanonaphthalene
16526-B 08406-F
07352-F

Diels-Alder Reaction
07791-M

Diesel Bus Garages
06055-B

Diesel Engine Combustion
01008-B

Diesel Engines 00650-B
04008-B 04374-B
04621-B 04665-B
05007-B 05059-B
06180-B 07506-B
07600-B 08497-B
08802-B 10044-B
14116-B 14119-B
14680-B 02705-D
02706-D 03562-D
05170-D 09343-D
14607-D 15464-D
01867-F 04628-F
04888-F 00325-B
11134-B 14207-B
14609-B 15418-B
00058-M

Diesel Exhaust Products
06640-F

Diesel Propulsion Power
Method 00241-J
00251-J

Diethyl Ketene
08853-M
See also: Ketenes

Diffusion 04033-C
00445-D 15104-M
15125-M

Diffusion Cells
03050-D

Diffusion Coefficients
03050-D 15032-M
15131-M 15265-M

Diffusion Flames
11143-B 12086-D
16363-D 05526-M
09172-M

Diffusion Models
11225-C

Digital Recording System
01405-D

Diisopropyl oxide
16236-M

Dimedone 03253-D

P-dimethylaminobenzaldehyde
02092-D 02161-D

Dimethylaminoazobenzene
03029-D

1,1-Dimethylhydrazine
01451-D

o-Dinitrobenzene
00768-D
See also: Organic Nitrogen Compounds
Benzene Compounds

Dinyl 05049-F

Dioxfine 05044-D
15837-H 15875-H
15948-H
See also: Olefins

Dioxane Sulfotrioxide
16082-H

Diphenylamines
02078-D
See also: Amines

4,4'Diphenylmethane
Diisocyanate (MDI)
03024-D

Diphenyls 02078-D
03024-D 04009-D
09750-H 15055-H

1,2-di-(4-pyridyl)
Ethylene 03537-D

Direct-Flame Incineration 00257-E

Discharge Detectors
15904-D

Discoloration
00115-H

Diseases of Crops and Ornamental Plants
12042-G

Diseases and Disorders
08331-F

Dispersion 03581-G

Disproportionation
16230-H

Dissociation 03404-D
01680-H 15055-H
16218-H

Distribution 14158-H

3,4,6,8,10-dodecapentaenedial 08827-H

Dogs 11632-F

Domestic Heating
04361-D 07230-A
09385-A 00275-D
05720-F

Dow Chemical Company
00730-J 06430-J

Driving Cycle
00277-D

Dry Cleaning
04114-A 09810-D
01335-D 14028-E

Dry Cleaning Solvents
04114-A

Drying 08206-D

Dust 10125-A
00451-D 02685-D
02706-D 02963-D
05081-D 08206-D
06305-E 15614-E
08130-F 09715-F
10210-F 08163-J
11472-J 15248-J
10336-J 10440-J

Economic Effects
08394-A 08504-D
08365-E 09060-F
03610-G 03612-G
03616-G 05342-G
12042-G 03027-J
00350-A 15078-H

Effluents 05404-D

Electric Automobiles
11265-B

Electric Charge
07273-H

Electric Power Production
12503-E

Electrical Conductivity
15421-H

Electrical Discharge
07495-H

Electrical Equipment
05315-H

Electrical Particle Counter 00862-D

Electrical Properties
02443-H 09172-H

Electrochemical Cleaning 14450-H

Electrochemical Methods
00097-D 08077-D

Electroconductivity Analyzers 06112-D

Electrodes 08077-D
03543-H

Electrofilters
13782-E

Electrolysis 03940-D

Electron Affinity
09750-H

Electron Capture Detectors 01832-D
03112-D 03955-D
05981-D

Electron Microscopy
02657-D

Electron Paramagnetic Resonance Spectra
02493-H

Electronic States
09030-H 09079-H

Electronic Transition
03522-H 11198-H

Electrophoresis
01991-D

Electrophoresis, Paper
04328-D 05084-D

Electroplating Industry
01700-F

Electrostatic Model
03063-M

Electrostatic Particle Counters 04085-D

Electrostatic Precipitation
00375-E 10588-E

Electrostatic Precipitators
00793-E 15614-E

Embryos 04718-F

Emission Inventories
00075-B 00737-B
11182-B 14010-C
02855-J 04770-J
00877-J 11824-J

Emission Sources
14811-M 15078-M

Emission Standards
00350-B 07035-B
03851-E 08075-E
00580-K 03505-L
03586-L 14842-L
16518-L

Emissivity 01824-M

Emphysema 11309-F

Endrin 00496-F

Energy Sources
00759-B

Energy Transfer
15846-M

Enforcement Procedures
02951-A 00975-B

Engine Acceleration
16132-D

Engine Design Modification
03580-B 02130-D
13040-D 00200-E
01875-E 05822-E

00831-E 13010-E
12453-E 16124-E
16187-E 15243-M

Engine Displacement
00350-B

Engine Exhausts
03701-B 13067-B
13051-B 14033-B
14116-B 14441-B
14402-B 14487-B
14607-B 15309-B
16138-B 16170-D
14075-E 15490-F
See also: Automotive Exhausts; Automotive Emissions

Engine Operating Cycles
03561-B 05207-B
07029-B 07035-B
08403-B 15883-B
16023-M

Engine Operation Modification
02430-B 13367-B
01411-E 02405-E
02753-E 03450-E
15321-E

Engine Performance
02130-D 13544-M

Environmental Pollution Control Commission (ENV) 14728-E

Enzymes 00658-F 07446-G 13078-M

Epidemiology 00373-B
00310-F 01186-F
01806-F 01813-F
01993-F 04051-F
04423-F 08245-F
16345-F 16542-F

Episodes 00310-A
00220-B 00378-B
00502-C 00765-C
10018-C 11480-F
00682-J

Equipment 05742-E

Equipment Criteria
03010-D 15167-M

Ester 02248-D
05010-D 08046-D
03001-M 08105-M
10020-M 14220-M

Ethanol Gasoline
12161-B

Ethylene Compounds
01145-A 10741-B
00344-C 01244-C
01660-C 00214-D
00383-D 00301-D
14044-D 04771-F
00007-F 11484-F
12278-F 00737-G
01179-G 01809-G
02537-G 05728-G
00070-G 00546-G
07107-G 11072-G
11100-G 13043-G
01681-L 07605-L
15715-L 00001-M
00101-M 01733-M
05226-M 07458-M
00078-M 00000-M
13032-M 13074-M
15104-M 15143-M
15140-M 15183-M
15265-M

Ethylene Glycol
00007-F

Ethylene Oxide
05294-F 06895-F

Excretions 04705-F
04709-F 06681-F

Exhaust Emissions
00324-B

Exhaust Manifold Reactors 11546-E

Exhaust Standards
04417-E

Exhaust System
06159-E

Experimental Animals
00176-F 00803-F
04104-F 04416-F
06099-F 07332-F
07475-F 10456-F
See: Animal Experiments

Experimental Equipment
00402-D 00771-D
00806-D 01301-D
01827-D 07018-D
08156-D 08761-D
15354-D 00183-M

Experimental Methods
00045-D 00966-D
03010-D 03527-D
03582-D 08761-D
10990-D 15354-D
00183-M 00941-F
01805-F 04153-F
08241-F 05868-G

Explosions 13099-D

Exposure Chambers
00142-D 01405-D
04025-D 03813-F
03820-F 03821-F
08026-F 08111-F
11539-F 15004-M

Exposure Levels
13134-D

Exposure Methods
01067-F 03821-F
08099-F 07068-F

Eye Irritation
00177-C 01802-C
04975-D 00084-F
00822-F 01401-F
01465-F 01501-F
01586-F 01605-F
02842-F 03270-F
03490-F 03978-F
04645-F 05680-F
05819-F 11360-F
12969-F 14119-F

Fatty Acids 10028-M
10119-M 13453-M
13465-M

Feasibility Studies
01626-B 11615-B
00092-D 00286-D
00471-D 08081-D
12887-D 15941-E
13886-F

Federal Air Quality
Act 1967 14772-L

Federal Installations
00200-E

Federal Government
00146-A 08275-A
09053-E

Field Tests 03061-D
08066-D 14825-D

Filters 06793-E
14018-E 15516-E
00183-M

Fish 07299-B

Fixed Bed Recovery
System 08352-E

Flame Afterburners
07637-B

Flame Emission Detectors
03867-D

Flame Ionization Method
09751-B 00141-D
01208-D 01225-D
01230-D 01238-D
01821-D 01920-D
01979-D 02159-D
02358-D 02500-D
02866-D 03291-D
03569-D 03855-D
01867-D 03977-D
04541-D 05617-D
05836-D 05817-D
05865-D 05981-D
06052-D 08257-D
08681-D 09734-D
11406-D 11554-D
11550-D 11567-D
13074-D 14722-D
14775-D 15200-D
16277-D 01736-J
01980-J 02762-J
11210-M

Flares 03864-E

Florisil 00309-D

Flow Rates 01358-M
02035-M 03525-M
08079-M

Flow-Volume Device
12955-F

Flowmeters 07656-B
08078-M

Fluid Bed Recovery
System 08352-E

Fluorenes 01897-D
02005-D 02797-D
02801-D 09200-M

Fluorescein 06504-D

Fluorescence
11615-B 00166-D
00203-D 00230-D
00580-D 00426-D
00440-D 00624-D
00815-D 01252-D
01826-D 01922-D
02081-D 04085-D
04248-D 07436-D
07745-D 07900-D
08580-D 08844-D
09507-D 11567-D
14125-D 14656-D
14662-D 15337-D
04715-F 00860-M
01054-M 15020-M
15119-M

Fluorescence Emission
Spectra
00054-D 02581-D
00580-D 07200-D
14662-D

Fluorescent Dye Trace
Analysis 06504-D

Fluorescent Indicator
Analysis (FIA Metho
05042-D

Fluorimetric Analysis
00026-D 05136-D
07455-D

Fluorometric Scanning
01252-D

Fluorometry 00328-D
00470-D 00928-D
02797-D 04055-D
11210-D

Foam 06305-E

Ford Thermactor Exhaus
Control System.
00171-B

Formaldehyde 00694-B
00845-D 01004-D
03086-D 03088-D
03097-D 03580-D
04018-F 01506-F
05394-F 07316-F

Formic Acid 02080-D

Fractionation 00203-D
05578-D

Free Fall Chemical Reactor
10207-H

Free Radicals 04029-D
01048-H 02082-H
02243-H 02405-H
02486-H 02517-H
02534-H 02536-H
04201-H 04583-H
08353-H 09040-H
13364-H 13945-H

Freezing Point 10169-H

Frustrated Multiple
Internal Reflection
(FMIR) 01451-D

Fuel Additives
04460-B 14461-B
01048-D 06025-D
02648-E 04856-F
05300-E 07071-E
06080-E 11236-E
14636-E 07270-F
14506-F 03280-I
11204-I 08460-M
08080-M 09745-M
15273-M

Fuel Cells 06950-B
07853-B 07970-B
08873-B 09100-B
09148-B 12521-B
08676-E 02445-M
03343-M 07082-M
14088-M

Fuel Charging 06086-B

Fuel Evaporation
00421-B 02411-E
04002-E 05537-E
05852-E 14020-E

Fuel Gases 01378-A
04095-B 05652-B
06488-B 09301-B
03083-E 04357-E
14075-E 14427-E
15544-M

Fuel Oil Preparation
Processes 10945-E

Fuel Oil Resources
08303-B

Fuel Oil Trends
08305-B

Fuel Oil Utilization
08305-B

Fuel Oil 00030-B
01626-B 01858-B
63164-B 05477-B
14171-B 04856-E
07302-F

Fuel Standards 07370-F

Fuel Tank Evaporation
Losses, 09347-B

Fuels 07204-A
02527-B 03158-B
06104-B 07945-B
08200-B 10044-B
11263-B 00275-D
06605-D 01107-E
07550-E 02405-M
02736-M 05208-M
06625-M 06897-M
14145-M 14388-M
15273-M

Fumes 00257-E

Fungi 10118-F
10928-M

Fungicides 05723-G

Furnaces 01558-B

Fusiware Reaction
08471-D

Galactolipids 07446-G

Gas Appliances 06299-B

Gas Density Cell
07850-D

Gases 01558-B 10429-B
00173-C 00092-D
00449-D 01278-D
01451-D 02349-D
02438-D 03050-D
03415-D 04541-D
05501-D 07150-D
08285-D 08510-D
09365-D 11270-D
11540-D 12663-D
12668-D 14430-D
14470-D 07802-E
08102-E 08211-F
08078-M 13876-M
14313-M 14862-M
13074-M 15104-M
15125-M 15145-M
15166-M 15185-M
15265-M 15744-M

Gas-Fired Incinerators
14867-E

Gas Liquefaction
10485-H

Gas Mixing Systems
08078-M 11543-M

Gas-off Products
04234-B 03828-D

Gasolines 01382-B
07852-B 06108-B
13795-B 14352-B
01230-D 01503-D
05056-D 08316-D
00574-D 15513-E
01015-F 01030-F
04500-F 04530-F
07270-F 08153-F
06221-F 03114-M
05208-M 13544-M
14184-M

Gas Ranges 14074-B

Gas Sampling 04630-B
15885-B 03675-C
03813-F
See also: sampling
Method

Gas Separation 04484-D
09388-D 15078-M
15187-M

Gas Separation Plants
15045-M

Gas Transport 15165-M

Gas Utilization
08304-B

Gaschromatographic
Column Circuit
08285-D

Gaseous Compounds
15218-M

Gases, Compressed
05006-D 00587-E

Gases, Expired
02406-D

Gases, Flue
10258-D 15614-E

Gases, Stack 11554-D
12072-D
See also: Stack Gases

Gases, Waste 07602-D
12072-D 13028-D
14478-D

Gasoline Engines
01806-B 02056-B
01803-B 04374-E

Gasoline Storage Tanks
08196-J

Genetic Effects
14709-M

Glycolic Compounds,
alpha 02790-D

Glyoxal 02079-D

Government 08045-M

Grape Leaves
05905-G

Graphic Arts Industry
15498-B

Greases 06498-G

Growth 04710-F

Gumicol Resins
02571-F

Guinea Pigs 00779-F
02277-F 06196-F

Halogens 05101-D
06582-D 08077-D
14428-D 00118-M
00917-M 00925-M
01677-M 01680-M
01682-M 01801-M
01801-M 02258-M
02480-M 03067-M
03070-M 03080-M
05615-M 15130-M

Hamsters 08276-F

Health Impairment
00020-B 00650-B
01763-B 01941-B
07230-B 07500-B
01504-C 00142-D
00451-D 00484-D
00728-D 00747-D
01302-D 02065-D
04262-D 06702-D
06858-D 07400-D
08079-D 08321-D
10767-D 11470-D
13154-D 15708-D
01351-E 00174-F
00306-F 00499-F
00910-F 01360-F
01916-F 01988-F
02357-F 02960-F
04137-F 05720-F
05882-F 07342-F
07575-F 08295-F
08511-F 08526-F
09360-F 11307-F
09764-M 11571-M
13933-M 14700-M

Health Statistics
03214-F 05659-F

Hearings - S 306,
00005-E

Heat Recovery Scheme
14388-M

Heat Transfer
09172-M 15046-M

Helical-Coil Distillation
Columns 15851-M

Hemorrhage Syndrome
08526-F

Hexafluoropropene
02854-D
See also: Halogenated
hydrocarbons

Hexenes 03767-D
08207-E 04253-F
03627-G 03629-G
03630-G 05777-G
05778-G 01579-M
See also: Olefins

Highways 15610-J

Hippuric Acid
06702-D

Histamine Release
04829-F

Hi-Vol Sampler
09936-J

Hopcalite 03969-M

Hot Gas Engine
15418-E

Hot Soak 09347-B

Humans 08851-B

Hybrid Electric Propulsion,
08875-B

Hydrazines 04440-D
03821-F

3-Hydrazinobenzothiazole
03091-D

Hydrocarbon-Air Combustion
Gas Model 16035-M

Hydrocarbon-Air Fuel Cell
Engines 14519-E

Hydrocarbon Analyser
06430-J

Hydrocarbon Fuels
06479-E

Hydrocarbon-Nitric Oxide System 00345-C

Hydrocarbon-Ozone Products 04999-G

Hydrocarbons, Aromatic
13494-A 01815-B
01902-B 01950-B
10775-B 12084-B
00773-C 01104-C
00014-D 00108-D
00155-D 00386-D
00399-D 00440-D
00727-D 00766-D
00867-D 00868-D
00911-D 00927-D
00928-D 00931-D
00934-D 01178-D
01461-D 01490-D
01581-D 01897-D
02085-D 02095-D
02096-D 02150-D
02226-D 02227-D
02505-D 02875-D
03258-D 03891-D
04254-D 04484-D
04930-D 05042-D
05257-D 05959-D
06661-D 07051-D
10089-D 10772-D
11164-D 11476-D
11550-D 12086-D
14607-D 15977-D
16701-D 00105-E
06674-E 10637-E
00022-F 00805-F
01029-F 01636-F
03033-F 05949-F
06004-F 06106-F
08417-F 09706-J
00110-M 00770-M
00914-M 01054-M
01855-M 01978-M
02160-M 02495-M
02605-M 03086-M
04017-M 04525-M
07305-M 08827-M
09197-M 09200-M
10120-M 13553-M
14145-M 14220-M
15186-M 15674-M
16052-M 16599-M

Hydrocarbons, Aromatic Polycyclic
01008-B 01050-B
01453-B 03543-B
05011-B 05109-B
09369-B 10741-B
16352-B 00750-F
01762-F 09024-F
04651-J 05675-J
08515-J 00936-J
15600-J 11147-M
15600-M

Hydrocarbons, Aliphatic
01902-B 00385-B
01649-C 01825-C
00584-D 00747-D
00845-D 00927-D
00931-D 01178-D
01802-D 01926-D
02080-D 02084-D
02088-D 02097-D
02098-D 02657-D
02875-D 03253-D
03369-D 03937-D
04086-D 04255-D
05257-D 15541-D
01722-E 15837-E
15875-E 01471-J
00766-J 01833-M
01801-M 02506-M
02528-M 02734-M
04454-M 04456-M
05051-M 07108-M
07798-M 09030-M
00197-M 10028-M
10120-M 11239-M
11248-M 13062-M
13713-M 14220-M
14648-M 15134-M
15238-M 15869-M
16027-M 16040-M
16348-M 16485-M
16605-M

Hydrocarbons, Chlorinated
04535-E 00809-F
05729-F 06221-F
09316-F 10105-F

Hydrocarbons, Chlorinated Solvents 04124-F

Hydrocarbons, Fluorinated
01426-F

Hydrocarbons, Halogenated
01763-B 01850-C
00264-D 00765-D
01177-D 01310-D
01356-D 01852-D
02121-D 02135-D
02227-D 02559-D
02601-D 02854-D
03732-D 05092-D
05210-D 06008-D
06858-D 06876-D
07146-D 07375-D
08077-D 08136-D
08294-D 08446-D
08471-D 11164-D
11476-D 14773-D
15355-D 15529-D
06285-E 00893-F
00887-F 03820-F
03821-F 08078-F
08026-F 08151-F
08295-F 11530-F
00120-M 01677-M
01875-M 02337-M
02517-M 02812-M
03488-M 03960-M
04228-M 04583-M
09116-M 11097-M
14145-M 14220-M
15139-M

Hydrocarbons, Polycyclic
26024-B 00055-B
09165-B 02023-B
14124-B 05284-F
11399-F

Hydrocarbons, Polynuclear
01362-B 01788-B
05005-B 00386-D
00399-D 00440-D
00479-D 00624-D
00728-D 00766-D
00767-D 00912-D
00926-D 00931-D
00934-D 01178-D
01302-D 01305-D
01665-D 01706-D
01720-D 01795-D
01826-D 01898-D
01999-D 02077-D
02081-D 02083-D
02085-D 02087-D
02090-D 02091-D
02092-D 02226-D
02607-D 02685-D
02805-D 03080-D
03234-D 03523-D
03542-D 03592-D
03955-D 04014-D
04085-D 04210-D
04528-D 04950-D
05084-D 05461-D
05501-D 05507-D
05981-D 06135-D
06858-D 06902-D
06955-D 07298-D

Hydrocarbons, Polynuclear (contd.) 07427-D 07435-D
07745-D 07908-D
08152-D 08296-D
08521-D 08589-D
09225-D 09388-D
09432-D 09597-D
10668-D 10755-D
10767-D 10946-D
11485-D 11567-D
11574-D 12086-D
14175-D 14662-D
00511-F 00058-M
00119-M 00355-M
00770-M 00869-M
00925-M 01034-M
01628-M 01650-M
01532-M 01655-M
02445-M 03086-M
04022-M 04205-M
05345-M 07273-M
09790-M 10519-M
14220-M 15401-M

Hydrocarbons - Unsaturated 00674-E

Hydrochloric Acid 02256-B 15392-B 16169-M

Hydrochloric Acid Manufacture 15392-B

Hydroconversion 14505-E

Hydrocracking 10458-E 04022-M

Hydrodesulfurization 13553-M 14164-M

Hydrofluoric 13499-M

Hydrogen Iodine 07462-M

Hydrogen Peroxide 01693-D

Hydrogenation 08390-B 08301-B 10777-B 05423-M 07458-M 08118-M

Hydrogenolysis 09700-M

Hydrogen Sulfide 12172-M

Hydrolysis 13090-M

Hydrosphere 14158-M

Hydroxystyryl Groups, Para 03081-D

Hypoxia 13960-F

Ice Fog 00834-C

Ileitis 00926-D

Immunology 00210-F 02175-F

Injection 07705-M

Impingers 08025-D

Incineration 01788-B 03864-D 04535-D 04838-D 08084-D 08536-D 14609-E 15657-M

Incinerator Effluents 05834-D 15657-M

Incinerators 00017-B 00288-B 01941-B 07561-B 08575-B 09831-B 12084-B 12150-B

Indicator Tube Method 08220-D

Industrial Areas 00479-D 05951-D 07150-D 07335-D 07575-D 08471-D 14830-D 03903-F 07574-F

Industrial Emission Sources 00243-A 00107-B 00379-B 00974-B 01050-B 01540-B 01744-B 02540-B 07570-B 07935-B 09784-B 15392-B 00479-D 11050-D 16435-D 01762-F 05954-F 07698-F 11426-F

Industrial Gas Analysis 09360-D

Inflammable Vapors 08471-D

Infrared Radiation 15729-C

Inspection 10662-B

Inspection, Automobile 00155-D

Instrument Insertion 07885-D

Instrumentation 03552-B 00108-D 00122-D 00141-D 00277-D 00449-D 00460-D 00623-D 00771-D 00862-D 00942-D 00977-D 01495-D 01505-D 01593-D 01832-D 02340-D 02358-D 02378-D 02406-D 02433-D 02868-D 02886-D 03485-D 03527-D 03560-D 03065-D 03067-D 04100-D 04262-D 04318-D 04440-D 04667-D 04742-D 04880-D 04881-D 04960-D 05135-D 05543-D 05617-D 05836-D 05863-D 06025-D 06050-D 06052-D 06203-D 06231-D 06284-D 06328-D 06445-D 06471-D 07380-D 07403-D 07427-D 07435-D 07647-D 07740-D 07850-D 08063-D 08285-D 08510-D 08592-D 09111-D 09365-D 09515-D 09597-D 09758-D 09888-D 10238-D 10480-D 10964-D 11270-D 11540-D 11574-D 14775-D 15400-D 15484-D 15529-D 16507-D

Integrating Nephelometer
15308-C

Interferometer 07403-D

Interferometric
Analysis 03485-D
07403-D

Internal Combustion
Engines 14608-E
08803-L

International Air
Quality Criteria
07251-F

International Peace
Bridge 01675-B

In Vitro Effects
08578-F

Ion Exchange Resins
07884-E 13499-H

Ionization 00060-D

Ionization Detector
04839-D

Ions 01973-D 08077-D
01652-H 02443-H
02489-H 03345-H
05047-H

Irradiation Chambers
06300-B 00068-D
07838-D 03575-H
07806-H

Irritant 06910-F

Isomerization
04547-D 02445-H

Isoprene 03879-D

Isotherm 13543-D

Isotopes 07181-A
01722-F 01652-H
01654-H 01655-H
05051-H 15065-H

Jet Airplanes 04793-B
09224-B 10428-B
01202-J 06788-J
(See also: Aircraft
Airplanes

Jet Fuel 10428-B

Ketones 00780-C
00166-D 01606-D
01998-D 02708-D
04154-D 07573-F
00355-H 00916-H
00917-H 01628-H
01652-H 01824-H
01833-H 01961-H
02154-H 03522-H
03985-H 04454-H
05333-H 07708-H
08105-H 08877-H
10512-H 12160-H
(See also: Benzophenones
B-Ketosulphones

Ketosulphones, beta
03869-H

Kidney 04705-F

Kilns 02023-B

Knock 14045-B

Kraft Black Liquor
08359-B 08354-D

Kraft Pulping 00379-B
07214-B 08350-B
16494-B 08354-D
08358-D 08357-D
08365-E 13505-H

Laboratory Animals
04701-F 04702-F
04703-F 07068-F
15064-H

Laboratory Facilities
00898-D 04318-D

Landfills 04419-B

Lasco Leaves
05485-G

Lasers 11030-D

15130-H 15410-H
15070-H 15055-H
15119-H 15491-H
16287-H

Lead 06804-D

Lead Compounds
06804-D 07285-D
00015-E

Legal & Administrative
04053-D 09234-D
14028-B 08508-F

Legislation 01853-B
01868-B 04315-B
08406-B 08463-E
13306-E

Lewis Acids 04011-H

Light Radiation 03883-B

Light Scattering
04951-D 02935-H
07495-H

Lignin 13505-H

Lipids 00473-F
07886-F

Liquefaction 12085-B
15134-H

Liquefied Natural
Gas 15085-H

Liquefied Petroleum
Gas (LPG) 05632-B

Liquid Film Resistance
15851-H

Liquid Fuels 04610-E
09195-E

Liquid Hydrocarbons
15966-D

Liquid Rocket Fuels
04440-D

Liquid Transport
15196-H

Literature Survey
01626-B 02637-E
02129-J 04285-H

Liver 04705-F
05720-F

Lubricants 03048-D

Luminescence 03807-D
15055-M

Lung Cancer 10541-B
00754-F 00842-F
01015-F 01800-F
01813-F 01844-F
03086-F 03480-F
03686-F 04473-F
04580-F 04590-F
05218-F 05304-F
05630-F 06366-F
06368-F 07161-F
07340-F 08243-F
08415-F 08511-F
08598-F 09435-F
10230-F 10241-F
11275-F 15345-F

Lung Clearance
00484-D 02063-D
01722-F 01805-F
08420-F

Lungs 02373-B
00475-F 04037-F
06163-F 07886-F
08274-F 10456-F
14724-F

Lymphoma 04177-F

Macro-Argon Ionization Detector 16377-D

Magnetic Field 15088-M

Maintenance, Automobile 00135-B 00155-D

Maleic Anhydride 02568-F

Manganese Cyclopentadienyl-tricarbonyl (MMT) 14506-F
See also: Fuel Additives

Manganese Sulfates 15463-M

Mangels 05666-G

Manometric Methods 06870-D

Materials Deterioration 00220-G 02472-M

Mathematical Analyses 14487-B 04357-D 10486-D 00047-F 00730-J 04550-M 10520-M 13580-M 13882-M 13933-M

Mathematical Modeling 15310-B 16017-B 00709-G 13857-F 00847-J 16023-M

Maximum Allowable Concentration 00001-B 02040-D 03773-D 05051-D 05052-D 05608-D 00561-E 00006-F 00409-F 01916-F 02551-F 02566-F 02571-F 02588-F 04070-F 04085-F 04087-F 04092-F 04111-F 04253-F 04258-F 05054-F 06802-F 06805-F 07251-F 07270-F 07573-F 07574-F 12272-F 12276-F 12284-F 00110-J 03018-J 00811-L 02580-L 05040-L 06677-L 07079-L 07197-L 07200-L 08805-L 13953-M

Medical Geography 01071-F

Membrane Filters 02205-D 15186-M

Mercaptides 00579-B 16404-B 01280-D 04020-D 05821-F 04314-M

Meteorology 11052-G

Metabolism 06820-F 07026-F 14711-F

Metal Fabrication and Finishing 05406-B

Meteorological Aspects 06043-G

Meteorology 00510-G 11004-G 00259-F 11010-G

Methane Ionization Detector 15400-D

Methanes 01344-B 02152-B 04410-B 08804-B 12068-B 00130-G 01828-G 03004-G 03873-G 15720-G 00108-D 00823-D 01823-D 03024-D 08838-D 11558-D 13050-D 14430-D 15200-D 15484-D 15730-D 16277-D 16507-D 16620-D 01550-E 03685-E 04170-E 04470-E 05250-E 06512-E 08082-E 16124-E 15000-F 01736-I 05057-J 00408-M 01602-M 01771-M 02467-M 03440-M 03550-M 04200-M 04403-M 10045-M 10292-M 13766-M 13851-M 14158-M 14379-M 14380-M 14622-M 15020-M 15078-M 15085-M 15088-M 15134-M 16485-M
See also: Natural Gas

Methanol 03018-J

Methemoglobinemia 04027-F

Methoxene 06433-D

5-Methyl-2-Benzothiazolone Hydrazone 02091-D 02097-D 03098-D

Methyl Bromide 05294-F

Methyl Iodine 07036-F 03785-G

Methyl Mercaptan
06719-E

Methylstyrene, alpha
12284-F

Methyl Sulfide
00952-C

Mice 01453-B 02573-B
00659-F 01030-F
02276-F 02532-F
04553-F 04709-F
04710-F 04714-F
06710-F 07302-F
07568-F 08210-F

Microorganisms
04419-B 01197-E
00658-F 00992-F

Mineral Components
00451-D

Mineral Processing
01544-B 02549-B
06886-J

Mining 13050-D
14830-D 15400-D
16507-D 16620-D
01550-E 04179-E

Missile Exhaust
06994-C

Missiles and Rockets
07451-B 06284-D

Mobile Air-Sampling Laboratory 02517-J
02822-J 02825-J

Mobile Testing Facilities
16170-D

Molecular Association
16052-M

Molecular Models
05051-M

Molecular Sieve Analysis
00585-E

Molecular Sieves
15069-D 00103-E
16486-E 02574-M

Molecular Structure
05100-M

Molecular Weight
07850-D 02734-M
05643-M

Molecules 04409-M

Molybdenum Compounds
16608-M

Monitoring
02549-D 02606-D
05450-D 04596-D

Monitoring Methods
01572-B

Monitoring Program
04616-J

Morbidity 01569-F
04084-F 09440-F

Mortality 00779-F
01051-F 01092-F
03086-F 03486-F
03886-F 06105-F
08331-F 13953-F

Mortality-Morbidity
08244-F

Motor Vehicle Pollution Control Act
07893-E

Mouse Necrosis Assay
00966-D

Mufflers (Anti-Smog)
07560-E

Multiple Chamber Incinerators 02252-B
06086-B 09825-B

Multiple-Tracer Diffusion Experiments
04055-C

Mutagenicity Testing
13886-F

Mutation 02552-F
12175-F 13886-F

Mylar Bags 00584-D
03071-D 08848-D

Naphthalenes
02081-D 03234-D
15708-D 07495-M

Naphthenic Soaps
15614-E

1,4 Naphthaquinones
02081-D

Naphthylamines 15708-D

National Air Sampling Network (NASN)
00730-J 02340-J
02381-J 03221-J

National Air Surveillance Network (NASN)
06584-J 06701-J

Natural Gas
08304-B 12085-B
08408-E 14379-M
14399-M 15134-M
See also: Methanes

Navy Toxicology Unit
03822-F

Nephelometry 06021-D

Nervous Activity, Effect
08221-F

Nervous System
02588-F 04124-F
06820-F 07306-F
07516-F 08442-F
14596-F

Neuromuscular Reaction
15490-F

Nitrates 00845-D
01975-D

Nitration 15238-M

Nitric Oxide (NO)
05411-B 00845-D
04635-D 06455-D
06455-D 10242-D
14119-F 00001-M
00054-M 01880-M
01881-M 02837-M
02838-M 02851-M
03114-M 03428-M

Nitric Oxide (NO) (contd.)
04033-M 05226-M
05425-M 08845-M
09078-M 13415-M
14295-M 16236-M

Nitrites 01975-D
01995-D 02094-D
02709-D

Nitro Benzene
02588-F
See: Benzene Compounds
Organic Nitrogen Compounds

Nitroethane 15730-D
See also: Organic
Nitrogen Compounds

Nitro-olefins
00210-F 00650-F
03490-F 03602-F
See also: Organic
Nitrogen Compounds

Nitrogen Dioxide (NO_2)
00464-B 01264-C
00620-D 00845-D
02747-D 02709-D
03096-D 10242-D
00097-F 01591-F
03820-F 08026-F
11539-F 00036-M
01579-M 02411-M
02857-M 02861-M
03420-M 03575-M
04633-M 09079-M
13415-M

Nitrogen Oxides
00109-B 01575-B
01058-B 03883-B
07573-B 13562-B
01244-C 07257-C
00002-D 00469-D
02130-D 03544-D
04857-D 06301-D
09830-D 09515-D
15271-E 15554-E
15765-E 08598-F
00120-M 02734-M
03107-M 03588-M
04550-M 04633-M
04653-M 05824-M
09046-M 13415-M
14385-M

Nitrogen Tetroxide
01580-B

5-Nitroisatin 02078-D

Nitromethane 15730-D
See also: Organic
Nitrogen Compounds
Methanes

Nitroparaffins 03684-D
See also: Organic
Nitrogen Compounds

Nitrous Acids 03684-D

Nitrous Oxide (N_2O)
15729-C

Noise 02538-D

Non Polar Compounds
01940-D

Nuclear Magnetic Resonance
08316-D

Nuclear Power Plants
04492-B 07546-B

Nuclear Submarines
01461-D 05042-D
15529-D 05209-E

Occupational Health
06702-D 08079-D
08321-D 09355-D
15154-D 01551-E
01550-E 04529-E
00090-F 00883-F
01080-F 01762-F
02288-F 04084-F
04177-F 05790-F
06406-F 06640-F
06820-F 07165-F
07956-F 08295-F
08329-F 15345-F

Ocean 06186-J

Ocular Sensitivity
11476-D

Odor Counteraction
00370-B 05170-D
14004-E 14341-E
15778-E

Odor Panels 14109-D

Odor Thresholds
14109-D

Odorant Chemicals
14109-D

Odorimetry 05170-D
08066-D 11486-D

Odors 00379-B
01885-B 06030-B
07089-B 09857-B
10075-B 14680-B
16298-B 16494-B
02786-D 03354-D
03542-D 14607-D
01867-E 07362-E
08504-E 08150-F

Oil Burners 02001-B
04361-B 05133-B
10075-B

Oil Refineries
07830-D 16016-D

Oils 15960-M

Olefins 01385-B
01958-B 02344-B
03761-B 08524-B
12967-B 13795-B
00177-C 00773-C
01264-C 02352-C
06632-C 09155-D
00772-D 01304-D
02158-D 02161-D
02163-D 02747-D
02854-D 03679-D
03737-D 04547-D
04060-D 05136-D
05585-D 12002-D
03085-E 06170-E
15271-E 00084-F
00622-F 01902-F
01591-F 01605-F
02173-F 02225-F
03610-G 03617-G
03618-G 05105-G
05606-G 06409-G
01085-H 01981-J
05627-J 00054-M
00128-M 00356-M
00565-M 01255-M
01680-M 01824-M
01835-M 01880-M
01881-M 02204-M
02445-M 02857-M
02861-M 03114-M

Olefins (contd.)
03428-M 04633-M
05058-M 05333-M
05611-M 07108-M
07458-M 07462-M
07509-M 07510-M
07708-M 09078-M
10120-M 12058-M
13034-M 13415-M
16083-M
See also: Aliphatic Hydrocarbons

Olfactory Perception
03775-D

Olfactory Threshold
11476-D

Open Burning
01076-B 01582-B

Operating Variables
00324-B 07635-B
16024-B 16152-D

Opinion Survey
07448-J

Optical Pumping
15045-M

Oranges, Mandarin
14944-E

Ordinances 03383-E

Organic Coatings
05259-H

Organic Compounds
02074-H

Organic Emissions
03104-J

Organic Nitrogen Compounds 00108-D
00146-D 00386-D
00389-D 00440-D
00768-D 00867-D
00868-D 00978-D
00951-D 01696-D
01826-D 01997-D
02078-D 02080-D
02094-D 03114-D
03604-D 03837-D
04171-D 15708-D
00869-M 01180-M
02082-M 03869-M
04285-M 05319-M
See also: Aliphatic Nitrogen Compounds

Organic Particulates
02851-J

Organic Phosphorus Compounds 05184-B
02248-D 07898-D

Organic Solids
14830-E

Organic Solvent Emissions
14494-F 07483-E

Organic Solvents
05648-B

Organic Sulfur Compounds
01885-B 00108-D
01178-D 01280-D
01784-D 04029-D
06065-D 05409-E
00353-M 04514-M
09745-M 15805-M
16599-M 16626-M

Organo-Aluminum Compounds
04248-C

Organo-Magnesium Compounds
16611-M

Organo-Metallics
16611-M

Orsat Apparatus 03552-B

Otto Engines 04731-B
15367-B 00269-B
14202-B

Oxidants 00961-B
00248-C 02476-C
05575-C 00328-D
01354-D 02747-D
03544-D 07650-D
09515-D 00811-F
05666-G 05065-G
06498-G 04320-H
00058-M 00238-M
01579-M 01747-M
03575-M 11050-M

Oxidation 00379-B
07518-C 00430-C
00295-D 00406-D
03234-D 06719-D
00058-M 01771-M
02286-M 02838-M
04201-M 04280-M
04454-M 05058-M
07509-M 07607-M
10045-M 13034-M
13931-M 14688-M
16463-M

Oxidation Reaction Mechanisms 11147-M

Oxides 03115-B

Oxygenated Fractions
03234-D 06609-D

Oxygenated Solvents
12084-B

Oxygenates 00464-B

Ozonated Olefins
03608-G

Ozone 00092-D
00214-D 00620-D
00328-D 02188-D
03537-D 03544-D
00050-D 10489-D
10637-E 11539-F
00026-F 03820-F
05666-G 14500-M
07498-M 03824-M
04992-M 05613-M

Ozone-Hydrocarbon Reaction 05680-F

Ozone Olefin Reaction
03595-G

Ozone Oxidation
15772-E

Ozonolysis 03537-D
00565-M

Paint Manufacturing
00746-B 07836-E

Paints 03991-D
16159-E

Palladium 03215-M

Paper Manufacturing
00379-B

Paper Pulp 13505-M

Paraffin, Liquid
07342-F

Paraldehyde 07316-F

Paramagnetic Resonance
07097-D

Particle Accumulation
06182-M

Particle Classifiers
09888-D

Particle Counters
02433-D 06203-D

Particle Growth
00069-M 14811-M

Particle Size 00484-D
01714-D 02433-D
02657-D 02963-D
06203-D 09738-D
09888-D 06795-E
02935-M 07271-M
07275-M

Particles, Settling
02205-D 00499-F

Particulates 00295-D
00440-D 00451-D
00492-D 00624-D
00707-D 01178-D
01592-D 01595-D
01708-D 02354-D
02786-D 02801-D
03542-D 10946-D
15808-D 08598-F
06186-J

Particulates, Municipal
02412-M

Particulate Classification
Methods
09738-D 01722-F

Patents (U.S.)
13554-E 13784-E
15861-E 15862-E

Pathological Techniques
03678-F 07342-F
08028-F

Pentadiene 07402-M

Pentanes 04083-F
04252-F 00128-M
01880-M 01881-M
See also: Olefins

Perchloromethylene
06221-E
See also: Halogenated
Hydrocarbons

Perfluoroisobutylene
02856-D
See also: Halogenated
Hydrocarbons

Periodic Acid 11147-M

Permeability 15032-M
15074-M 15405-M

Permeation Standards
11270-D

Peroxyacyl Nitrates
(PAN) 00610-D
00220-G 00737-G
03292-G 03472-G
06409-G 14008-G
00238-M

Perturbations 05045-M
See Combustion,
Oscillatory

Perylenes 03234-D
08645-D

Pesticides 00388-D
01616-D 15996-D
16318-D 16526-D
06858-D 11164-D
01051-F 01080-F
03062-F 04107-F
04901-F 06219-F
06406-F 06847-F
07552-F 07956-F
07964-F 08329-F
09090-F 10105-F
10356-F 04544-G
03931-J 04228-M
11097-M
See also: Hydrocarbons,
Halogenated

Petroleum Distribution
09840-B

Petroleum Paraffin
Vapor 07156-D

Petroleum Production
01165-B 01453-B
01620-B 03128-B
06104-B 05191-D
07304-J 04022-M

Petroleum Refineries
03872-E 08198-J
11014-J

Petroleum Refining
00071-A 01838-B
02017-B 03420-B
03871-B 08524-B
09835-B 00638-E
14798-E 03675-G
03864-E 06127-E
06159-E 06170-E
08594-E 10458-E
06869-F 03289-I
13553-M

Phenalen-1-one
11218-D 15337-D

Phenanthrenes 03234-D

Phenols 08524-B
14767-B 00911-D
08150-F 16463-M
See also: Benzene
Compounds

Phenyls Compounds
00146-D 15999-E

Phenylhydrazine
02496-M

Phenylurethylene
04245-G

Phillips-Stirling Engine
15243-M

Phosphorescence 00146-D
00460-D 00858-D
07097-D 11567-D

Phosphorimetry 00146-D
00860-D 00998-D

Photochemical 01070-B
01602-G 00345-G
01603-F

Photochemical Oxidants
04066-F

Photochemical Oxidation
02244-B

Photochemical Reactions
01488-B 01575-B
01815-B 05007-B
06300-B 09004-B
15310-B 00130-C
00242-C 00302-C
00602-C 00618-C
00629-C 00757-C
01027-C 01104-C
01264-C 05817-C
01818-C 06632-C
07257-C 00100-D
01304-D 01683-D
02747-D 05572-D
06955-D 06636-E
01463-F 03770-F
04321-F 04645-F
04650-F 03615-G
00231-H 00353-H
00355-H 00356-H
00916-H 00917-H
00925-H 01026-H
01186-H 01210-H
01518-H 01579-H
01833-H 01961-H
02203-H 02243-H
02258-H 02357-H
02412-H 01445-H
02493-H 02496-H
02851-H 03009-H
03086-H 04285-H
04633-H 05100-H
06720-H 07463-H
07510-H 07806-H
08858-H 09082-H
10129-H 10519-H
12169-H 15046-H
15139-H 15911-H

Photochemical Reactivities
05535-C 00465-C

Photochemistry
03522-H 05613-H
01849-H 10512-H
11259-H

Photocolorimetric
Analysis 05376-D
05383-D 06025-D
06050-D 06092-D
09152-D 08446-D
08490-D

Photocrystallization
00350-H

Photodegradation
05215-H

Photodynamic Assay
00966-D 01302-D

Photoelimination
00916-H 00917-H
01233-H

Photoionization
Resonance Spectra
1A295-H

Photolysis 10034-D
00877-H 09080-H
01233-H 07512-H
01648-H 02337-H
02528-H 03000-H
03066-H 03184-H
09078-H 02245-H
07798-H 10512-H
15019-H 15491-H
15045-H 03659-H
04486-H 08101-H
09267-H 11188-H

Photometric Measurement
Methods 00328-D
02121-D 02188-D
02843-D 03024-D
06203-D 06883-D
07386-D 11540-D

Photooxidation 00109-B
01244-C 01587-C
01984-C 03858-C
00068-D 06301-D
15354-D 05819-F
00001-H 00034-H
01747-H 01978-H
02472-H 02567-H
02534-H 02535-H
02857-H 03051-H
02855-H 03114-H
03428-H 03488-H
04228-H 04583-H
04092-H 05335-H
05011-H 05024-H
07108-H 08353-H
08827-H 08845-H
09079-H 11248-H
13364-H

Photoquinoxol Reactions
05100-H

Photosynthesis 03627-G
00231-H

Physicochemical Studies
16608-H

Phytotoxicants
08433-D 08445-D
00009-G 00316-G
00184-G 03116-G
03305-G 03575-G
03611-G 03612-G
03615-G 03616-G
03618-G 04998-G
05610-G 05666-G
05725-G 12042-G
16357-G 00001-H
07988-H
See: Ethylenes

4-Picoline 00768-D

Pinto Beans 05690-F
03627-G

Pipercaal Test
01729-D

Pitch-Coke Plant
07300-B

Planning & Zoning
08500-J

Plans and Programs
00599-A 03504-J
01604-K 07235-K

Plant Damage
03265-B 05844-B
00242-C 00633-F
01402-F 02842-F
00229-G 00235-G
00316-G 00961-G
02299-G 03116-G
03305-G 03596-G
03608-G 03609-G
03615-G 03616-G
03617-G 03629-G
04994-G 04999-G
05105-G 05502-G
05410-G 05485-G
05666-G 05724-G
05725-G 05778-G
06078-G
11072-G 12042-G
12045-G 03027-J
09764-H

Plant Growth 00601-G
01179-G 03629-G
03630-G 04998-G
05344-G 06409-G
06546-G

Plant Indicators
05584-B 02209-G
16357-G

Plant Injury
02537-G 05610-G

Plants 037836
05756-G 07167-G
11010-G

Plastic Bags
01983-H

Plastics 08486-B
11493-B 14609-E

Plastics Manufacturing
00905-B 04139-E

Platinum 04558-E
15271-E

Pneumonia 07342-F

Polar Compounds
03949-D 15329-M
15439-M

Polarographic Methods
05456-D 15730-D

Pollutants 00984-A

Pollution Precursors
01747-M

Polychlorinated Biphenyl (PCB) 10318-E
See also: Halogenated Hydrocarbons

Polyfluoroethylene
08486-B
See also: Halogenated Hydrocarbons

Polymerization
15970-M

Polymers 04514-M
15131-M 15405-M

Polynuclear Aromatic Compounds 00737-J
02944-J
See also: Hydrocarbons, Polynuclear Hydrocarbons, Polycyclic

Polynuclear Compounds
00621-B 01068-B
01404-B 01803-B
06898-B 09405-B
00195-P 00518-P
00665-P 00870-P
01029-P 01081-P
01285-P 01868-P
01692-P 01844-P
03480-P 03686-P
04706-P 06004-P
06383-P 06947-P
07782-P 09435-P
13953-P 00625-J
00689-J 02160-J
02587-J 03526-J
05675-J 06384-J
11577-J
See also: Hydrocarbons, Polynuclear Hydrocarbons, Polycyclic

Polystyrene 13580-F

Polysulfones 16085-M

Polyurethane 07165-F

Polyvinyl Chloride Resin 08294-D
15657-M

Polyvinylpyrrolidone 01049-F

Porous Glass Filters 15187-M

Porous Polyaromatic Polymer beads 15802-D

Proportional Sampler 07478-D

Positive Crankcase Ventilator (PCV) 14193-E

Potassium Compounds 04926-M 13713-M

Power Cycles 06488-B

Power Plants 01654-B

Power Production 01482-B 03113-B
03592-D 02443-M
07682-M

Precursors, Pollution 00108-D 03215-D

Pressure 03448-D
09046-M

Primary Metallurgical Processes 01657-B
06611-E 06886-J
11015-J

Printing 05929-E
16435-E

Process Modification 06175-E 06611-E
11035-E

Propane Gas 14494-F

Propenes 04233-B
05850-B 11143-B
03858-C 06482-C
02160-M 02253-M
04653-M

Propellants 02601-D

Propenes 02454-D
07498-M 08845-M
09700-M
See also: Olefins

Propulsion Power Method 01575-B 01582-B
01585-B 01584-B
01404-B 01488-B
07595-B 12521-B
02786-D 02785-D
01867-E

Protective Masks 04648-D

Proton Magnetic Resonance Analysis 08316-D

Psychophysiological Functions 05419-F

Public Affairs 01073-A

Pulmonary Function 02223-F 03076-F

Pulmonary Resistance 01584-F 04829-F
06910-F

Imonary Tumors
04711-P
See also: Lung Cancer

Imonary Ventilation
08109-P 12955-P

ups 09840-B

pil Size Determination
12969-P

rmadimes 06080-M

rmes 01973-D
01999-D 02077-D
02136-D 03238-D
14301-D 05331-P
01631-M 01635-M
02495-M 06720-M

ridines 00765-D
00768-D 00993-D
01634-M 01635-M
04285-M

rolysis 08359-B
10429-B 10631-B
13665-B 04895-D
05404-D 08294-D
11558-D 07882-E
00101-M 03286-M
03345-M 07457-M
07450-M 15914-M
15988-M

ntion Field
03066-M 03184-M
00916-M 09082-M
01026-M 04565-M

ostilinear Fluorescence
Spectra
04248-D 10755-D
14662-D

nching 00928-D
01034-M 15046-M
01824-M
See Spectrofluorometry

pectrofluorometry
00928-D 00770-M
See also: Spectrophotometry, Fluorimetric
Quenching

Quenchophosphorimetry
00386-D

Quinolines 00203-D
00624-E 00998-D

Quinones 02081-D
02053-D 02087-D
02096-D 02853-M

Rabbits 08442-P
12580-P

Radiations, Light
10041-M

Radiations, Ultraviolet
04197-D 09267-M
10041-M

Radioactive Tracer
Studies 00484-D
03105-D 15765-D
01805-P 08042-P
05611-M 10119-M

Radio Chemistry
04454-M

Radiolysis 00190-M
01833-M 04454-M

Radiomedes 00188-D

Rain 10556-B

Rankin Engine
14202-E 14145-M

Rate 00664-P 02605-P
08274-P 08550-P
11484-P

Reaction Kinetics
02335-B 04621-B
13951-B 00773-C
02352-C 02476-C
03544-D 10034-D
04871-E 08207-E
01241-M 00120-M
00128-M 00161-M
00190-M 01026-M
01241-M 01632-M
01648-M 01677-M
01680-M 01682-M
01771-M 01833-M
01880-M 01891-M
01978-M 02253-M
02496-M 02534-M
02535-M 02838-M
03066-M 03067-M
03068-M 03088-M
03184-M 03478-M
03488-M 03552-M
04228-M 04483-M
04583-M 05058-M
05226-M 05423-M
05425-M 07457-M
07458-M 07462-M
07512-M 07791-M
08197-M 09700-M
10045-M 12292-M
13034-M 13686-M
14335-M 14688-M
14917-M 15020-M
15046-M 15524-M
15207-M 16348-M

Reaction Mechanisms
00344-C 00629-C
00951-C 03004-C
08526-P 09024-P
00161-M 01633-M
01680-M 01881-M
01961-M 02445-M
02437-M 02838-M
03067-M 03068-M
03088-M 04201-M
04228-M 05423-M
05425-M 05824-M
07458-M 07798-M
08353-M 09078-M
09079-M 09080-M
09082-M 09700-M
09745-M 12058-M
13051-M 14258-M
14579-M 14301-M
14309-M 14917-M
15019-M 15046-M
15198-M 15238-M
15784-M 15914-M

Reactivity Index
05321-B

Reactivity Scales
07807-D

Recirculation
04809-E

Recombination Reactions
02245-M 05045-M

Recycling Combustion Gases
07881-E

Reduction 13015-E
13467-E 04275-M
09082-M 10039-M
13391-M

Refining Aliphatic, Naphthenic, and Aromatic Hydrocarbons, New Process 13915-E

Refractive Index
09099-M 09116-M

Regeneration 15872-M

Regulation 3
08376-B 03554-E

Regulations 01654-B
04808-B 09781-B
03010-D 14028-E
08463-E 10085-E
10320-E

Reid Vapor Pressure
14483-E

Reproduction 02332-F
04712-F 07842-F

Research Methodologies
00484-D 00966-D
05836-D 07838-D
01208-D 00281-F
00754-F 00805-F
00910-F 04051-F

Research Programs 03085-A
01685-D 03339-E
06636-E 08598-F
11489-F 02376-E
10555-E 08645-M

Residence Time Oil Burners 11231-B

Residual Fuel Oils
04668-M

Resources 08304-B

Respiratory Diseases
06055-B 10542-B
00281-F 00306-F
00310-F 07162-F
03027-J

Respiratory Flow Resistance 08305-F

Respiratory Function
02277-F 06840-F

Respiratory Sensitization
05737-F

Respiratory Survey
05652-J

Respiratory Symptoms
10987-F

Respiratory System
05372-F 07165-F
11632-F

Respiratory Tract
00409-F 07027-F
14711-F 14724-F

Retention 07020-F
10105-F 13657-F
14724-F 16219-F

Rhodamine B 02188-D

Rocket Propellants
04758-F

Roofing Tar Paper Plant 08163-J

Rotating-Slit Aerosol Spectrometer
09758-D

Rubber 04706-F
03524-H

Rubber, Aging
08475-H

Rubber Cracking 04520-H

Rubber Manufacturing
00805-B 00257-E
05737-F 03030-J

Rubber Tires 04805-D
10767-D

Rule 66 05106-B
08376-B 08553-B
08557-B 07187-B
05471-E 14728-E
07485-F 08554-B
08556-B 08826-B
09324-B 08558-M

Running Evaporation Losses 04022-B
09347-B 14127-B

Safety Equipment
04179-E

Samplers 00119-M
00214-D 00584-D
00620-D 02378-D
03527-D 04440-D
07104-D 02474-E
06793-E 00119-M

Sampling Method
01558-B 11254-B
00188-D 00214-D
00224-D 00469-D
00584-D 00610-D
00620-D 00747-D
01025-D 01178-D
01269-D 01304-D
01355-D 01392-D
01499-D 01592-D
01876-D 01991-D
02158-D 02205-D
02253-D 02325-D
02358-D 02378-D
02460-D 02500-D
02786-D 02886-D
03425-D 03449-D
03527-D 03570-D
03582-D 03966-D
03971-D 04014-D
04049-D 04055-D
04206-D 04440-D
04547-D 04667-D
04772-D 04825-D
04960-D 04975-D
05209-D 05536-D
06112-D 06682-D
07061-D 07285-D
07375-D 07709-D
08270-D 08290-D
08848-D 08880-D
08952-D 09754-D
10668-D 10946-D
11574-D 11165-D
12072-D 14476-D
15277-D 15808-D
15909-D 00119-M
See also: Gas Sampling

Sanitary Clearance Zones
08106-J

Screens 08330-F

Satellites 12887-D

Scientific Research
03058-A

Scrubbers 03339-E
03872-E 04581-E
12503-E 15821-E
15862-E

Sea Lab I 03829-D

Seasonal 00271-B

Sensors 15294-M

Serum 07783-F

Ships 00538-E

Silica Gels 00542-D
01023-D 01333-D
01409-D 07706-D
13783-E

Simulation 00600-C
02660-D 16132-D
05149-E 07027-F
14097-J 09025-M
01990-M 07806-M

Skin 01079-F
04702-F 04705-F

Skin Cancer 02276-F
04655-F 08210-F

Slag 02569-B

Smog 01584-B
01812-B 08376-B
15310-B 01481-C
01504-C 01602-C
02476-C 04088-C
06043-C 00224-C
03105-D 03544-D
04075-D 11237-D
01645-E 03851-E
05140-E 00632-F
01596-F 02277-F
04321-F 04416-F
04066-F 05176-F
06165-F 06600-F
10436-F 11307-F
00009-G 00235-G
03610-G 05486-G
14180-J 09281-K
00034-M 00069-M
01815-M 05613-M
05824-M 05869-M
06103-M 06695-M
07806-M

Smog Chambers 15354-D

Smog-Forming Potential
05523-B

Smoke Generating Devices
11615-B

Smoke Reduction
04610-E

Smokes 11615-B
14124-B 14892-B
00862-D 01278-D
03955-D 04614-D
04053-D 06135-D
01867-E 03886-F
08015-F 03454-J
03526-J 02203-M

Smoking 06808-B
01278-D 10964-D
15708-D 16701-D
03486-F 03696-F
07161-F 11307-F
14711-F 15345-F

Social Attitudes
07601-L

Socioeconomic Factors
09440-F

Soiling Index
10665-D 02340-J
06701-J

Soils 07400-D
10099-G 06720-M
07188-M

Solar Radiation
08485-J

Solid Waste Disposal
08084-E 15657-H

Solubility 14882-M
15032-M 15143-M
15183-M 15744-M
16040-M

Solvent Extraction
15874-M

Solvent Recovery System
02764-E

Solvent Vapors
03773-D 05848-D
07706-D 10435-E
05418-F

Solvents 00746-B
05106-B 07187-B
08376-B 08553-B
08557-B 09781-B
09857-B 10660-B
15352-B 00747-D
01333-D 02875-D
03773-D 03991-D
04143-D 04206-D
04716-D 06200-D
07335-D 07386-D
08290-D 08848-D
15354-D 02112-E
03762-E 03763-E
05471-E 05629-E
06221-E 08345-E
08352-E 08536-E
11033-E 13783-E
14757-E 00800-F
03902-F 04148-F
08554-E 08556-E
08826-E 08858-M
14882-M

Soot 01744-B 02015-B
10741-B 10748-B
14074-B 00275-D
01714-D 06135-D
12086-D 13605-D
14301-D 06127-F
08210-F 08274-F
08599-F 03986-M
04201-M 05325-M
11571-M

Sources 00337-B
05746-B 16174-I

Space Cabins 04234-B
08851-B 09013-B
09751-B 00096-F
10613-F 00447-J

Space Craft 07977-B
08057-B 06292-M
07972-F 11141-F

Space Craft Atmospheres
01430-D 02406-D
02460-D 03430-D
03828-D 06624-D
11593-F 15294-M

Space Vehicle
04470-B

Spark Ignition Engines
00592-B 02527-B
04008-B 04731-B
05007-B 05596-B
05632-B 05655-B
15883-B 04772-D
05380-E 08567-E
14975-E 15273-M

Spectrometer, Multiple-Scan Interference
03485-D

Spectrometry 09751-B
10257-M

Spectrometry, Atomic Absorption
04716-D

Spectrometry, Correlation
04880-D 04881-D

Spectrometry, Infrared
00277-D 00747-D
01310-D 01451-D
02848-D 03267-D
02500-D 03448-D
03485-D 04102-D
04631-D 05561-D
05572-D 06052-D
06070-D 06135-D
06284-D 06609-D
07627-D 08592-D
08838-D 09111-D
11030-D 12072-D
12579-D 14470-D
16620-D 05255-H
02467-M 14917-M
15119-M

Spectrometry, Ultraviolet 00449-D
00624-D 01305-D
02581-D 02797-D
02803-D 02886-D
06135-D 07981-D
08643-D 08644-D
09111-D 11498-D
09030-M 15529-M

Spectrophotometry
07656-B 00911-D
00146-D 00214-D
00230-D 00295-D
00386-D 00765-D
00766-D 00768-D
00868-D 01356-D
01693-D 01696-D
01922-D 01995-D
02078-D 02080-D
02081-D 02084-D
02085-D 02086-D
02090-D 02091-D
02092-D 02094-D
02098-D 02161-D
02336-D 02559-D
02785-D 02796-D
02799-D 02801-D
02805-D 03081-D
03430-D 03523-D
03670-D 03684-D
03727-D 03938-D
04053-D 04064-D
04085-D 04102-D
04318-D 04329-D
04716-D 04857-D
04880-D 04881-D
04930-D 05191-D
06065-D 07455-D
07578-D 08592-D
08599-D 09111-D
09225-D 10767-D
11068-D 11091-D
11093-D 00111-J
00231-M 02082-M
02804-M 15278-M

Spectrophotometry, Fluorescent 15977-D

Spectrophotometry, Fluorometric 00634-D
01705-D 02805-D
03253-D 03523-D
06662-D 07743-D
09557-D 10755-D
11068-D 14125-D
14658-D 14662-D

Spectroscopy 00108-D
00440-D 01205-D
00916-M 01630-M
02489-M 04409-M

Spectroscopy, Infrared
00271-B

Spectroscopy, Mass
00955-C 00114-D
01304-D 01305-D
02406-D 02460-D
03554-D 05257-D
06135-D 10034-D
13805-D 14173-D
02204-M 04483-M

Spectroscopy Molecular
06070-D

Spinach 05664-G

Spores 10118-F
10020-M

Spot Tests 00386-D
00492-D 00767-D
00867-D 00917-D
01994-D 01997-D
02079-D 02080-D
02081-D 02083-D
02086-D 02087-D
02088-D 02089-D
02090-D 02091-D
02092-D 02094-D
02097-D 03081-D
06894-D 01034-M
02802-M 02804-M

Stabilized Combustion Chamber Deposits
14461-B

Stack Gases 00030-B
01362-B 01482-B
01941-B 02153-B
See also: Gases, Stack

Stagnation Index
11082-G

Standards and Criteria
00155-D 05951-D
05952-D 00499-F

Statistical Analyses
08331-F 11267-J

Steam Engine 12521-B

Steam Plants 05012-B
05067-B 06488-B
07546-B

Stilbenes 02090-D
02803-D 13465-M

Stokes' Diameters
06231-D

Storehouses 03951-J

Stratoflex Project
04015-B

Streets 13784-B

Styrene Fumes
15287-J

Styrenes 08514-B
03505-D 04210-D
10772-D 02551-F
08483-F 02802-H

Styrol 05954-F

Submarines 00081-B
02336-D 03180-D
08519-D 00373-E
03145-E 06285-E
16158-E 05057-J

Sucrose 02796-D
See Carbohydrates

Sulfation 14220-H

Sulfides 10494-B
00231-H 13062-H

Sulfonation 14220-H
15784-H 16017-H

Sulfur Compounds 08559-B
00142-D 00845-D
00942-D 01784-D
06005-D 08354-D
09432-D 11409-D
13779-D 14428-D
00197-H

Sulfur Dioxide 00620-D
00845-D 00942-D
01784-D 03105-D
03520-D 04825-D
05191-D 09515-D
11540-D 16398-D
12505-E 13467-E
00598-F 01518-H
02374-H 06102-H
07108-H 08845-H
13301-H 15329-H
15330-H 15816-H
15848-H 15970-H
16046-H 16056-H
16083-H 16463-H
16605-H

Sulfur Dioxide Compounds
15996-B

Sulfur Dioxide Removal
08476-E 14830-E

Sulfur Oxides Control
15960-E

Sulfur Trioxide 15805-H

Sulfuric Acid
15784-H

Summer Travel
01573-B

Surface Coating
08513-B 08517-B
10060-B 03702-E
03703-E 10083-E

Surface Coating Operations
05648-B 09818-B
00230-D 01333-D
05848-D

Surfactant 07886-F

Survey Methods 00337-B
11259-F 11261-F
00330-[illegible]

Synergism 00235-C
06640-F 11309-F
04544-G

Synergistic Effects
02352-C

Synthetic Fibers
02060-H

Synthetic Liquid Fuels
07298-D 07302-F

Synthetic Organic Chemicals 07109-A

Synthetic Rubber
07575-D

Synthetic Rubber Cracking 03095-H

System Engineering
07615-E

Tandem Throttle Valve System 14351-E

Technicon Auto-Analyzer
00977-D

Temperature 00034-H
01570-H 02467-H
02935-H 06649-H
16040-H

Temperature Gradients
15125-H

Terpene Biosynthesis
13078-H

Terpenes 06163-F
09003-F 05756-G

Testing Facilities
09348-D 16361-D

Tetrachloroethane
03802-F
See also: Halogenated Hydrocarbons

Tetrachloroethylene
04253-F
See also: Halogenated Hydrocarbons

Tetraethyl Lead
14462-B 05456-D
06025-D 07285-D
14459-E 07270-F
03280-I 05440-H
09745-H
See also: Fuel Additives

Tetrafluorohydrazine
08077-D

Tetramethyllead
06025-D 05440-H
09745-H
See also: Fuel Additives

Textiles 00115-H
02060-H

Thermionic Detectors
07749-D

Thermocatalytic Detectors
10238-D

Thermochemistry
00120-H

Thermodynamics
00120-H 00128-H
01677-H 01682-H
01814-H 01880-H
01881-H 03446-H
06997-H 10045-H
13544-H 13550-H
13713-H 14668-H
15046-H 15048-H
15459-H 15524-H

Tissues 01335-B
06328-D 06635-E
10116-G 06182-H

Thiophene 08445-F
See also: Organic Sulfur Compounds

Thresholds 04529-B
06680-F 08150-F
08155-F

Thymol 08150-F

Timed Fuel Injection
03080-B 01580-E
10539-E 15895-E

Tissue Culture
02375-E 00664-F
01062-F 06840-F
07972-F 11299-F

Tissues 03962-F
04575-F 06710-F
10456-F

Tobacco 03265-B
00184-G 00696-G

Tobacco Tar
03678-F

Toluene Diisocyanate
08305-F 12955-F

Toluenes 07519-C
04210-D 16435-E
03651-F 03800-F
04082-F 06063-F
06905-F 07068-F
07165-F 07475-F
08441-F
See also: Benzene Compounds

Total Hydrocarbon Analyser 08519-D

Toxic Tolerances
03556-A 00419-F
01083-F 06857-F
01346-F 02601-F
03641-F 03701-F
04092-F 04107-F
04114-F 04142-F
04600-F 04738-F
04901-F 06163-F
07366-F 08469-F
10613-F

Toxicity 01601-D
00809-F 01568-F
02571-F 03620-F
03821-F 03902-F
04104-F 04258-F
04927-F 05729-F
06710-F 06529-F
06496-F 06840-F
07068-F 07270-F
07308-F 07352-F
07475-F 07571-F
07972-F 08028-F
08026-F 08295-F
08431-F 08442-F
08526-F 08801-F
09002-F 09074-F
09985-F 11241-F
11539-F 11595-F
12272-F 12276-F
12284-F 14596-F
16345-F 16356-F
13933-M

Traffic 01366-J

Trans-2-Butene
11682-F
See also: Olefins
Aliphatic Hydrocarbons

Transmissometers
09111-D

Transpiration
05777-G

Transport Properties
03486-M

Trapping Methods
00030-D 01870-D
01235-D 03291-D
03425-D 04541-D
07887-D 08270-D
08356-D 08848-D

1,1,1-Trichloroethane
07375-D
See also: Halogenated Hydrocarbons

Trichloroethylene
06221-E 06869-F
See also: Halogenated Hydrocarbons

Trimethylamine
15816-M

Trimethylbenzene
01984-C
See also: Benzene Compounds

Tritium 07181-A

Triton X100
15969-D

Trucks 01404-B

Tumors 01038-B
04705-F 05298-F
07291-F 07540-F

Tunnels 02152-B
03215-B 15769-B
12579-D 11612-E

Turbidimetry 04931-D
08136-D

Turbines 09329-E

Turbines, Gas 06435-D

Turpentine Vapors
07332-F

Ultrasonics 09086-M

Ultraviolet Gas Analyser
02886-D 07586-D

Ultraviolet Light Radiation 00602-C

Ultraviolet Radiation
01481-C 01365-B
02337-M 06710-M

Uhor Apparatus 08592-D

Uranium Catalysts
06214-E

Urban Areas 04487-A
03202-B 00165-D
11152-B 03581-C
14010-C 00114-D
00203-D 00230-D
01795-D 02227-D
02797-D 10444-D
02477-F 03486-F
05620-F 08245-F
01786-J 01880-J

Urban Areas (contd.)
03451-J 07303-J
11287-J 08571-K

Urinalysis 06702-D
09315-F

Uterine Muscle, Human
16252-F

Valves 04773-D 07104-D

Vapor Phase Gas
03983-E

Vapor Pressure 03525-M
06648-M

Vapor Recovery Systems
04802-E 05859-E
15836-E

Vaporization 14850-E
14944-E 06648-M

Vaporization Tank
Carburetion
07845-E

Vapors 00440-D
01393-D 02162-D
02470-D 04100-D
04480-D 04547-D
06284-D 07061-D
07135-D 07373-D
15749-D 08161-E
15520-E 02571-F
00069-M 00608-M
01026-M 15012-M
15019-M 15486-M
15744-M

Vertical Dilution
Technique 05536-D

Vehicular Operation
04630-E

Ventilation 01544-E
02152-E 04198-J

Vinyl Chloride
02135-D

Viruses 01668-F
11275-F
See also: Microorganisms

Viscosity 15088-M

Visibility 03103-D
04031-D 04975-D

Vital Staining 06907-F

Vitamin A 07340-F

Volatility 09421-E
13795-E 14127-E
01354-D 04014-D
06206-D 08365-E
06537-M

Washout Coefficient
00173-C

Waste Heat Recovery
07836-E

Water Pollution
09830-E

Weather Modification
06482-C

Weiss Ring Oven
03402-D

Wichhold Combustion
Technique 11171-E

Wildlife 04844-C

Winds 07356-J

World Health Organization
(WHO) 00948-J
06885-L

Xylenes 04219-D
10080-D 06905-F
06663-F 07471-F
09700-M 16054-M

Zenith Ekplas System
04659-E 06831-E
09357-E

Zeolites 01891-M

GEOGRAPHIC LOCATION INDEX

UNITED STATES

Alabama
Birmingham 00534-J
03458-J 07448-J

Alaska 13040-J
Fairbanks 00834-C

California 00164-A
00319-B 00969-B
07625-B 07844-B
00155-C 00277-C
04318-C 05339-C
02405-E 06032-E
09027-E 03612-G
03613-G 03461-J
02066-K 03614-K
03944-K 09281-K
00157-L 01955-L
03007-L 03563-L
03586-L 16518-L
Los Angeles County
00224-D 14341-E
Fresno 03433-J
Los Angeles
06723-A 00107-B
03871-B 04492-B
05097-B 05106-B
05113-B 06031-B
07167-B 07623-B
08376-B 08553-B
08557-B 09785-B
00502-C 01481-C
04988-C 05575-C
01592-D 04973-D
05572-D 04962-E
00639-F 00779-F
01029-F 03978-F
04416-F 05176-F
10456-F 03609-G
03615-G 01980-J
03462-J 05110-J
05573-J 05627-J
14180-J 04616-K
05571-K 07483-K
08554-K 08556-K
08826-K 09324-K
San Francisco
01211-A 05106-B
0133-D 01592-D
03104-J 03564-K

Colorado 01010-J

Connecticut 11227-A

05895-J 14997-J
New Britain 06966-J

District of Columbia
01621-D 06290-J

Florida 03404-J
Jacksonville
00220-B

Hawaii
Sand Island-Oahu
03420-B

Idaho
Lewiston 00054-B
06535-J

Illinois
Chicago 03461-J
East St. Louis
11224-J 016030-K

Indiana 09737-B
03461-J
Indianapolis
02822-J

Kentucky
Northern 02370-K
Louisville 03520-D

Louisiana
New Orleans 00638-F

Massachusetts
Boston 02239-J
02317-J

Maryland
Baltimore 02825-J

Michigan
Midland 06430-J

Minnesota 03409-J

Missouri
St. Louis 01090-B
03449-D 03773-D
03027-J

Montana 03410-J

New Jersey 00599-A

08899-K

New York State
00673-B 05008-J
Erie County
02833-J
Nassau County
05009-J
Niagara County
04864-J
Chemung County
04834-J
Westchester County
04933-J 06946-J
New York City
11152-B 09440-F
10987-F 11489-F
00682-J 00169-K
New York City
07564-B
John F. Kennedy Inter-
national Airport
01202-J

New York - New Jersey
03454-J

North Carolina
03438-A

Ohio 05598-K
Southwestern
02376-K
Cincinnati
00929-C 04933-C
01089-J 05336-J
St. Bernard
03426-J

Oregon
Mid-Willamette Valley
06977-J

Pennsylvania
Allegheny County
09370-K
Philadelphia
00679-B 04596-D
07550-K
Pittsburgh
00727-J

South Carolina
Charleston

03506-J

Tennessee
Nashville
00931-D 00847-J
01471-J

Texas
El Paso 03505-J

16266-J

Washington
03604-J
Clark County
01949-J
Clarkston 00054-B
06535-J
Ferndale 03864-E

West Virginia
Kanawha Valley
11259-F 11260-F
11261-F

United States
01270-J 03353-K
Northeastern
05420-B

FOREIGN

Argentina 11087-B

Australia 08633-B
Sidney 05501-D
05675-J

Austria
Vienna 15248-J

Belgium
Liege 11577-J

British Columbia
Chilliwack
00852-J 05652-J

Canada
Ontario 00889-J

Czechoslovakia
Ostravia-Karvina
04179-E

Denmark 03686-F

England 02152-B
02635-B 07945-B
01020-F 03086-F
03806-F 04251-F
03526-J 08408-K
London
04467-A 11489-F
04651-J
Southampton
14917-M

Europe 03122-B
03128-B 14475-L
14842-L

France 00453-C
02438-D 02541-E
Lyons 07408-J
Paris 00898-D
09788-J

Finland 01794-F

Germany 07230-B
02973-E 04357-E
08594-E 11912-E
15913-E 16435-E
07235-K 07079-K

East Germany (DDR-
German Democratic
Republic)
10553-E 00411-L
Nordrhine Westphalia
02885-D 14028-E
Berlin 14722-D
08322-J 14776-J
15154-J 15575-J
Frankfurt 09234-D
Heidelberg 11572-J

Greece
Athens 09117-J

Hungary 16440-J

Iran
Teheran 09209-J

Italy 03202-B
Florence 13788-J
Genoa 04423-F
Rome 09655-B
Turin 15600-J
Pescara 14785-J
Siena 08315-J
09936-J

Japan 04212-A 06744-A
16136-B 16494-B
08112-D 07336-D
04373-F 15746-F
06760-J 07593-J
14679-J 13366-K
07197-L
Osaka 15610-J

Tokyo 00451-D
03214-J 07198-J

Latin America
04052-A

Mexico
Mexico City 05839-J

Netherlands 14479-A
16345-F
Rotterdam 14534-J

New Zealand 07159-F

Norway 13952-B
13953-F 03686-J

Poland 10320-K

South Africa 01356-D
02415-D

Spain 16523-A

Sweden 06280-B

Switzerland 11457-B
13784-E 16336-J
Zurich 15857-H

U.S.S.R.
03205-A 05194-B
07299-B 08165-B
08524-B 02607-D
03938-D 04064-D
07298-D 06674-E
10926-E 16444-E
02566-F 02588-F
02596-F 02606-F
03933-F 04109-F
04110-F 06069-F
07316-F 11476-F
01270-J 03930-J
03931-J 07202-J

07304-J 08196-J
02585-L 05940-L
07200-L 14338-M
Baku 07830-0
Grozny 11914-J
Moscow 07400-0
07830-0 03363-J
04091-J
Tashkent 03928-J

★ U. S. GOVERNMENT PRINTING OFFICE : 1970 O - 408-888

STANDARD TITLE PAGE FOR TECHNICAL REPORTS	1. Report No. NAPCA-Pub-AP-75	3. Recipient's Catalog No.

4. Title and Subtitle

Hydrocarbons and Air Pollution: An Annotated Bibliography Part I. Categories A to E and Part II. Categories F to H and Indexes

5. Report Date: October 1970

6. Performing Organization Code

7. Author(s)

8. Performing Organization Report No.

9. Performing Organization Name and Address

Air Pollution Technical Information Center, OTIF
National Air Pollution Control Administration, EHS, PHS, EHEW
Raleigh, North Carolina 27605

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Agency Name and Address

Same as Above

13. Type of Report & Period Covered

14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstracts

Approximately 2300 abstracts of technical literature related to hydrocarbons and air pollution are presented. The abstracted literature was collected from many sources; all are now included in the information retrieval system of the Air Pollution Technical Information Center (APTIC). Most of the literature is dated 1959 through 1970. The abstracts are arranged in thirteen broad subject categories. Four indexes are included: subject, title, author, and geographical location. The author index lists first and second (if any) authors individually. The geographical location index includes two sections: United States (states/localities); and Foreign (countries/cities).

17. Key Words and Document Analysis. (a). Descriptors

Air pollution
Hydrocarbons
Bibliographies
Abstracts
Indexes (documentation)

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 13B, 5B

18. Distribution Statement	Superintendent of Documents	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 1190
SOD No: PB2.300: AP-75	Government Printing Office Washington, D. C. 20402	20. Security Class (This Page) UNCLASSIFIED	22. Price SOD $5.00 (2 volume set)

FORM NBS-38411-101